Indian Institute of Foreign Trade

SURVEY
of
INDIA'S EXPORT POTENTIAL
of
MARINE PRODUCTS

[illegible]

March 1970

Vol. I (of six)

FOR LIMITED
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SURVEY
OF
INDIA'S EXPORT POTENTIAL
OF
MARINE PRODUCTS

prepared under the sponsorship of
THE EXPORT PROMOTION DIVISION
U.S. Agency for International Development, New Delhi
for
THE MINISTRY OF FOREIGN TRADE
Government of India

INDIAN INSTITUTE OF FOREIGN TRADE
NEW DELHI

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AGENCY FOR INTERNATIONAL DEVELOPMENT

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August 15, 1970

Mr. S. K. Modwel
Deputy Secretary
Ministry of Foreign Trade
Government of India
New Delhi - 1

Dear Mr. Modwel:

I am pleased to transmit copies of the study entitled "Survey of India's Export Potential for Marine Products". This is the latest in a series of action-oriented surveys sponsored by the USAID Export Promotion Division under the aegis of a program entered into with the Ministry of Foreign Trade. The work of preparing this particular study was performed by the Indian Institute of Foreign Trade.

Approximately a half dozen similar commodity surveys have been completed under this program in the past two years, including those on:

1) Fresh and Processed Fruits and Vegetables
2) Spices
3) Oilcakes and Allied Products
4) Machine Tools
5) Textiles and Made-up Garments
6) Leather and Leather Products
7) Jute and Jute Products
8) Wood and Wood Products

In addition, a functional study of the "Overseas Transport and Freight Structure in India's Export Trade", a special study on "India's Export Potential within the Indian Ocean Basin", and a survey of Indian Export Marketing organizations have been completed.

Other export commodity studies which are nearing completion are:
1) Shellac
2) Tobacco and Tobacco Products; and
3) Export of Engineering Services by Indian firms.

In addition, several other functional surveys commissioned under this program are nearing completion. These include:

1) Export Procedures and Documentation
2) Domestic Transportation Problems of Export Cargo

Other studies in progress include surveys on:

1) Mica
2) Coir
3) Plastics
4) Sports Goods
5) Tariff Liberalization, and
6) Investment Priorities for Export Industries

A formal presentation of the findings and recommendations of this study has been made to industry and trade representatives, as well as to the Government of India. This is in keeping with our usual practice. The purpose of these presentations is to permit rapid dissemination of the most relevant findings and recommendations of the study group and also to allow for cross-examination of the study group.

The findings and recommendations cited in the study are, of course, the responsibility of the Indian Institute of Foreign Trade. The report is a thoughtful work and should receive a careful reading by industry and Government officials concerned with this subject.

We are particularly enthusiastic about the findings of this study. The survey has identified several simple, yet profound facts. These are that:

a) There is an ample supply of a wide range of marine products, especially prawns, lobster and fine fish, off India's coast line. Even the minimal exploration which has been undertaken has shown extremely encouraging findings.

b) There is also a firm demand for these marine products in world markets, which is highly elastic.

c) The cost/benefit ratio of investment in this industry is favorable in that there is ample justification to carry out the full program of investment recommendations as soon as possible.

What is basically required is to allow interested parties to "harvest" these marine products, process them quickly and effectively, and ship them to eager markets. Under these extremely favorable circumstances, it seems clear that with suitable support, the industry will grow dramatically and provide both an attractive livelihood for many workers and an important source of foreign exchange earnings for India.

More specifically, the report identifies the urgency of introducing modern deep sea fishing techniques to capitalize on the great potential of marine products which exists in off-shore waters. Presently there are only a half dozen large ocean-going trawlers engaged in this work in Indian waters. By comparison there are over 4,000 trawlers in the Gulf of Mexico, and about 500 such vessels engaged in shrimping operations in the Persian Gulf. There is ample room for a wide range of participants in this industry, and the survey suggests that firms which have had long experience in similar fishing operations should be encouraged to come to India to help develop the industry's exciting potential.

The study team suggests that export earnings from marine products are expected to increase from a level of Rupees 31 crores ($47 million) in 1969/70 to Rupees 118 crores ($157 million) by 1978-79. It is my belief, however, that this ambitious target can be readily surpassed if decisions are quickly taken to implement the basic findings and recommendations of this report.

There is little uncertainty in the report as to what should be done -- rather, time is of the essence.

I trust that the report will be instrumental in increasing India's foreign exchange earnings from marine products. The USAID Mission is ready to discuss further appropriate assistance which may be required to promote the implementation of these proposals.

Sincerely yours,

Ludwig Rudel
Export Promotion Division

.D. SHOURIE
RECTOR-GENERAL
***

INDIAN INSTITUTE OF FOREIGN TRADE
H-24, GREEN PARK EXTENSION
NEW DELHI-16

D.O.No.MR/MPEPS/69-70

July 31, 1970

Dear Mr. Thomas,

I have pleasure in transmitting the Report of the Survey on "India's Export Potential of Marine Products" which has been completed in fulfilment of the contract taken by the Institute from the United States Agency for International Development.

The Survey has covered a wide range of commodities and products. Attempt has been made to go into depth in studying various aspects relating to their production and export. Besides conducting a comprehensive survey of the problems within the country in relation to the selected commodities and products, the Survey was conducted in sixteen selected countries of Europe, Americas, Far-East and South-East Asia. Effort was also made to secure information and data in relation to other important maritime countries.

For determining the measures to strengthen the supply base and to augment the export effort, the Survey adopted an inter-disciplinary approach encompassing oceanography, marine biology, marine engineering, craft & gear, fish processing technology, infrastructural facilities including fishing harbours, ship to shore & ship to ship communications, processing plants, cold & frozen storage facilities, and transportation arrangements.

The Report embodies suggestions and recommendations of far-reaching importance. We believe that on the effective implementation of these recommendations it should be possible to raise the level of exports of marine products from Rs 331 million in 1969 to Rs 609 million in 1973-74 and Rs 1,180 million in 1978-79.

Opportunity was taken to present to the Government of India, in a specially convened meeting, the major conclusions and recommendations arising from this Survey. It is heartening that even before the release of the official Report, the Ministry of Foreign Trade has taken the initiative in starting the work of implementation of some of the major recommendations.

In forwarding this Report I take the opportunity to convey to you, on behalf of the Indian Institute of Foreign Trade, our appreciation of the cooperation and assistance received from USAID in the execution of this Survey.

Kindest regards,

Yours sincerely,

(H.D. SHOURIE)

Mr. Francis H. Thomas,
Chief,
Export Promotion Division,
United States Agency for
International Development,
Chankya Puri,
NEW DELHI-11.

Survey of India's Export Potential of Marine Products

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PART-A

PREFACE

The Marine Products Industry of India is highly export-oriented. Exports of fishery products have been showing phenomenal growth in recent years, rising from Rs 39 million in 1961-62 to about Rs 247 million in 1968-69. Notwithstanding the impressive export performance of this industry, India's share in the world trade of marine products is even today only about one per cent. The vast coastline of India is replete with numerous high unit value yielding commercial fisheries, of which only shrimp, in frozen, canned and dried forms, currently constitutes the principal item of export, representing 87.6 per cent of the total exports of Rs 331 million in 1969. While the world demand for marine products is constantly mounting the supply constraint for promoting their exports from India at a faster rate is yet a limiting factor. India at present exploits only a small portion of its fishery resources. The slower rate in augmenting fish production can be ascribed to under-exploitation of rich potential of the seas around India. Meagre infrastructural facilities, non-availability of large fishing vessels for deep sea and high sea operations, and inadequate modern processing facilities are some of the major impediments hampering the pace of development of the industry.

Objectives

It is against this background that the Indian Institute of Foreign Trade, with the approval of the Ministry of Foreign Trade, has undertaken a comprehensive Survey of India's Export Potential of Marine Products on an assignment from the Export Promotion Division of the United States Agency for International Development with the following objectives:

a) to study the Marine Products industry in India, and in selected major supplying countries with a view to identifying the lines on which the industry in India needs to be developed with the necessary accent on exports;

b) to assess the present and potential markets available for Indian marine products;

c) to determine specific action to be taken by the Government of India as well as industry and trade for bringing the Indian industry on par with world fishing industry;

d) to indicate investment decisions necessary for improving the Indian industry's position in the world trade of seafoods.

Commodities Surveyed

The Survey has undertaken detailed investigation of problems and prospects in relation to the following fishery commodities:

a)	Frozen Fishery Commodities	Shrimp, Lobsters, Froglegs, Crabs, Perches, Pomfrets, and Turtle Meat

b) Canned Fishery Commodities	Shrimp, Sardines, Mackerel, Tuna, Crab Meat, and Eel
c) Dried Fish	Shrimp, Bombay Duck and Fish
d) By-Products	Sharkfins, Fishmaws, Prawn pickles, Fish Meal, Fish Oil, Seashells, Seaweeds, and Fish Sausages

Survey Countries

The countries selected for Survey were broadly classified into two groups (a) supplying countries (b) market countries:

Supplying Countries

Americas : USA, Canada, Mexico and Venezuela

Europe : Norway, Denmark, Netherlands, UK, and Poland

South East Asia and Far East : Japan, South Korea, Thailand, Singapore and Hong Kong

Market Countries

Americas : USA and Canada

Europe : UK and Switzerland

South East Asia and Far East : Japan and Hong Kong

Methodology

The Survey was completed in five phases: desk research, commodity study in India, writing of preliminary report, overseas survey and preparation of final report. As a first step, a comprehensive bibliography of available literature relating to various aspects of fishery science, such as environmental factors, exploratory studies, fishery resources, infrastructure and status of fishing and processing sectors of the industry was prepared. This was followed by a thorough desk research with a view to acquiring complete product knowledge which was supplemented by discussions with concerned organisations and departments of the Central and the maritime State Governments. The material and data thus collected during the course of the desk research were fully collated, tabulated and analysed.

Based on the preliminary investigations and desk research, including situational analysis, certain hypotheses were formulated before undertaking field study in India in relation to major problem areas with the object of bridging the necessary gaps as also to test the hypotheses. The preliminary examination, however, revealed that the most important impediment in boosting the exports of seafood products from India was one of strengthening the supply base, world markets being, by and large, firm and demand elastic. Hence the Survey was inevitably required to adopt an inter-disciplinary approach encompassing all areas instrumental for stepping up production such as oceanography, marine biology, infrastructural base, marine engineering, craft and gear, and fish processing technology. Before embarking on the field study in India, industry-wise and leader unit-wise selectivity approach was adopted for identification of units and respondents, ensuring representativeness and proportionality of the sample to the universe. The criteria for the selection of survey units comprised: size of the unit as reflected in the f.o.b. value of exports performance during 1968, degree of integration of processing activities and geographical location of the units as detailed below:

i) Twelve large exporters accounting for 45 per cent of the total exports (with individual exports above Rs 5 million each) were selected. Twenty-seven medium units exporting between Rs 1 million and Rs 5 million and seven small exporters with an export performance below Rs 1 million each were covered.

ii) For determining the degree of integration of the processing activity, the units were classified into the following four categories:

   a) Owning freezing and canning plants as well as boats;

   b) Owning only freezing or canning plants and boats;

   c) Owning freezing or canning capacity but relying entirely on open market for raw material supplies;

   d) Making use of hired or leased freezing capacity.

iii) To identify the problems unique or peculiar to the States or the centres of location, the coverage ensured selection of units from all maritime areas.

In addition to the above, 11 representative units were selected for intensive study so as to evaluate the impact of various production and export marketing problems faced by them. In order to determine relative competitiveness in the export trade their ex-factory, f.o.b. and c.i.f. costs were computed for analysis and interpretation. Simultaneously, a detailed study and evaluation of the policies and programmes of the Central and maritime State Governments in relation to various aspects of the industry were undertaken.

Information and data collected during the course of the commodity study in India were analysed, interpreted and embodied in a preliminary report which formed the basis for determining the strategy for the overseas survey. The areas to be covered in the survey abroad were clearly identified and appropriate check-lists and schedules relating to various problem areas of the industry were drawn. In accordance with the availability of time and foreign exchange, priorities were allocated for selection of the items of work depending upon their importance in each country in conformity with the selectivity approach employed for the field survey within India.

The methodology adopted in surveying the buying countries was necessarily different from that of the supplying countries. Similarly, the type of data and information, including market characteristics and trading practices, varied from one country to another and, therefore, specific product groups had to be identified for in-depth study. An attempt was made to draw lessons from all leading maritime countries which experienced similar problems during the process of development of their fishery industries. Specific areas like designing and construction of modern fishing harbours and large trawlers, marine diesel engines and electronic equipment, processing techniques, quality control and inplant inspection system, marketing arrangements & trading practices, and institutional set-up responsible for systematic development of fisheries in the survey countries were also covered. The results of these different phases are coordinated and embodied in the final report.

The Report

The Report is presented in six Volumes. Volume I embodies the summary of major conclusions and recommendations for implemental action, strategy for the development of Indian marine products industry, a comprehensive and integrated programme for the development of fisheries - fishery projects, investment pattern for fishing industry, development of new product lines, proposed organisational set-up to develop and regulate the industry on scientific basis and the anticipated volume of fish landings and exports both during short and medium terms.

Volume II gives a succinct account of the review of global marine fisheries, infrastructural facilities and Central and State fishery development programme. It also examines and evaluates the need for intensified research, training and development schemes in the years to come.

Volume III examines the existing status of the seafood industry in India coupled with the detailed analysis of the problems in principal areas like production, processing, export marketing and finance & credit. Necessary remedial measures have been suggested based on the experience of other countries.

In Volume IV is given a comprehensive commodity review covering various fisheries of commercial importance and their item-wise and country-wise export prospects. This Volume highlights world trends in production, consumption, demand and market size for selected items. New items offering export potential have also been identified and markets pinpointed.

While relevant data on various aspects of fisheries are included in summary form in the main Report, wherever necessary, for comparative and in-depth analysis, detailed statistics are presented for the sake of convenience and ready reference in Volume V. This Volume presents mass data in relation to catches, disposition, consumption and export-import collected from published and unpublished sources in India and abroad.

For the benefit of the trade and industry lists of exporters and importers of marine products in selected countries, indicating the commodities dealt with by them, information about the manufacturers of machinery, equipment and ancillary items, organisations and institutions connected with the development of the seafood industry and a comprehensive bibliography have been given in Volume VI.

Survey Team

The Survey Team comprised the following officers of the IIFT.

Shri V. Vithal Babu Project Leader
Deputy Director General

Shri K. Chidambaram
Fishery Consultant

Shri S. Miskeith
Consultant (Marine Engineering)

Dr. V.K. Pillai
Consultant (Processing Technology)

Dr. H.B. Desai
Associate Professor

Shri M.L. Varma
Assistant Director

Shri V. Ramachandriah
Research Officer

Shri A.K. Sengupta
Research Officer

Mr. Manual A. Sanchez Jr., President, American Trawlers Inc., Brownsville, Texas (USA) was associated with the Survey Team in the capacity of a Consultant, his services having been provided by the USAID. Mr. R.T.Wenstrom, another USAID Consultant on Craft & Gear, assisted the Team during the commodity study in India and the survey in USA.

For the technical part of the Survey the Team had the benefit of association of part-time Consultants: Dr. R.R. Prasad, Assistant Director General, Indian Council of Agricultural Research, New Delhi (Oceanography and Fishery Resources); Shri G.K. Kuriyan, Sr. Research Officer, Central Institute of Fisheries Technology, Cochin (Craft and Gear); Shri S.K. Banerji, Sr. Research Officer, Central Marine Fisheries Research Institute, Cochin (Fishery Statistics); Shri N.P. Bhakta, Dy. Director, UNDP Pre-Investment Project, Bangalore (Port Facilities).

Acknowledgements

The Institute expresses its grateful thanks to the Export Promotion Division of USAID for giving this assignment. The suggestions of Mr. Ludwig Rudel, Mr. Francis H. Thomas and Shri V.P. Chopra of the USAID at various stages have been very helpful in finalising the Report.

The Institute wishes to place on record its deep sense of gratitude to Shri K.B. Lall, Secretary to the Government of India in the Ministry of Foreign Trade, who piloted the implementation of major recommendations soon after their presentation on March 10, 1970, even before the final Report was released. The discussions held by the Survey Team with Shri M.A. Quraishi, Additional Secretary, Ministry of Food, Agriculture, Community Development & Cooperation, and Shri P.K. Samal, Joint Secretary, and Smt. S.L. Singla, Director, Ministry of Foreign Trade, have been of great value.

Thanks are also due to the Ministries of Finance; Industrial Development, Internal Trade & Company Affairs; and Shipping & Transport and Planning Commission for their cooperation at different stages.

The Institute is grateful to the heads of the Indian Missions and the Commercial Representatives in all the survey countries for their cooperation during the overseas survey.

The Institute expresses its gratitude to the Directors of Fisheries of maritime States who provided unstinted support to the Survey Team in the execution of their work. Thanks are also due to the trade and industry as well as associations, organisations and institutions connected with the development of the industry for the keen interest evinced by them in the Survey work. The cooperation extended by the Marine Products Export Promotion Council was of immense help in conducting the Survey.

The credit for the work of the Survey and preparation of the Report, however, is due entirely to the dynamic leadership of Shri V. Vithal Babu, Deputy Director General, who has ably guided and supervised the work at all stages amidst his other pre-occupations.

With his intimate knowledge of the Indian conditions as also of the fishing industry in major countries of the world, the association of Shri K. Chidambaram, Deputy Commissioner (Fisheries), Department of Agriculture, Ministry of Food, Agriculture, Community Development & Cooperation, Government of India, was highly rewarding to the Institute.

The Institute acknowledges with gratitude the services of Mr. Manual A. Sanchez Jr., whose vast experience in shrimp trawling in USA, Brazil and Nicaragua has enriched the Report.

The knowledge and experience of Shri S. Miskeith, Superintending Engineer, Deep Sea Fishing Station, Bombay and Dr. V.K. Pillai, Director, Central Institute of Fisheries

Technology, Ernakulam, have greatly assisted in preparing action-oriented recommendations.

The technical expertise of part-time Consultants in different spheres of fishing activity was of great help to the Survey Team.

But for the strenuous and diligent work of the Survey Team, including Dr. H.B. Desai, Sarvashri M.L. Varma, V. Ramachandriah and A.K. Sengupta of the Institute, the Report could not have been prepared to full satisfaction within the time limit prescribed for the purpose.

The Institute is also greatly appreciative of the unflinching cooperation of the secretarial staff including Sarvashri V.P. Ahuja, V.K. Kapoor, A.K. Gupta, S. Mani, B.L. Sharma, R.C. Sethi, and D.S. Rawat.

H.D. Shourie
Director General

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Introduction

Marine products constitute a significant growth-industry with an average annual increase of 8.2 per cent in world trade as against 6.5 per cent in world production during 1960-68. Barring some of the centrally planned economies, Scandinavian countries and Japan (though a net exporter, she will continue to be a sizable market for a variety of fish products), indications based on the FAO projections are that the rest of the world will continue to experience deficit in fish supplies for human consumption over the next fifteen years.

With a vast coastline of about 5,000 kms, and the bulk of marine fish landings currently accruing mainly from the inshore area up to 10-15 fms (20-30 metres depth), India has an inherent advantage in boosting the production from off-shore and deep sea fishing beyond 10 fms and 40 fms respectively for export of high unit value items such as shrimps, lobsters, tuna, pomfrets and bream. Nevertheless, her share in annual world exports of seafoods of about $ 2.22 billion is as insignificant as $ 27 million, or one per cent, in 1968.

The important conclusions and recommendations of the Survey are outlined in Part A of this Volume, indicating enormous potential for expanding production, processing and export marketing of India's marine products. In Part B, which deals with the strategy for Statewise development of the marine products industry in India, concrete steps are suggested for implemental action to step up exports from Rs 247 million in 1968-69 to Rs 609 million by 1973-74 and Rs 1,180 million by 1978-79 as shown in Annexure A1.

WORLD PERSPECTIVE AND INDIA'S POSITION

Demand and Supply

Increasing attention has over the years been bestowed on augmenting the world supply of marine fish and fishery products owing to continued pressure on land. World supply of processed fishery commodities has risen from 11.85 million tonnes in 1961 to 15.72 million tonnes in 1965 and 19.05 million tonnes in 1968. On the other hand, world trade has expanded from 4.45 million tonnes ($ 1.28 billion) in 1961 to 6.29 million tonnes ($ 1.94 billion) in 1965 and 7.74 million tonnes ($ 2.22 billion) in 1968.

The world demand in respect of seven processed fishery commodity groups for 1975 and 1985 as derived from the live weight projections of the FAO for food (human consumption), feed (for poultry and cattle) and other purposes (Manure, oils, etc.) is given below:

Table A-1

Projections of World Demand and Supply for Fishery Products 1/

(Million tonnes)

	1975			1985		
	Supply	Demand	Balance	Supply	Demand	Balance
Fish for food	16.25	14.90	1.35	22.44	21.60	0.84
Fish for feed	4.93	5.79	-0.86	6.16	8.50	-2.34
Fish for other purposes	0.89[@]	1.53[@]	-0.64	1.01[@]	1.75[@]	-0.74
	22.07	21.22	-0.15	29.61	31.85	-2.24

The above table reflects the overall marginal surplus of fish for food and substantial deficit of fish for feed and other purposes. Although an overall marginal surplus of food fisheries has been estimated over the next fifteen years,

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1/ Source: Yearbook of Fishery Statistics, 1968, FAO.

@ IIFT estimates.

the import potential of most of the affluent markets like USA, Canada, EEC countries and Japan in respect of special varieties of fishery commodities is envisaged to grow at a much faster pace than the annual average growth rate of 8.2 per cent during the last decade. This prospect signifies the scope for accelerating India's exports in substantial measure to these markets, provided a bold programme of deep sea fishing is urgently implemented. Notwithstanding the fact that there is a sizable deficit of fish for feed and for other purposes during the above projected period, India may not be in a position to meet more than a small proportion of the world demand after meeting the growing domestic requirements. In relative terms, India's gains will undoubtedly lie in the export of selected varieties of food fisheries of high unit value yielding items than feed fish.

Major Producers

Of the 150 countries harvesting fish, about 38 million tonnes or 60 per cent is accounted for during 1968 by seven major maritime nations, namely Peru (10.5 million tonnes), Japan (8.7 million tonnes), USSR (6.1 million tonnes), China (Mainland) (5.8 million tonnes), Norway (2.8 million tonnes), USA (2.4 million tonnes) and India (1.5 million tonnes).

The value of the world catch (marine and fresh water) at the fisherman's level has been roughly estimated to range between $ 8 to $ 9 billion, during 1968. It may be pointed out that value estimation of producing countries and groups of species presents two limitations. In the first place, value data in respect of some of the major producing countries including the USSR, South Africa, India and Iceland are not available. Secondly, the unit value of individual species of each group differs from one country to another mainly due to the wide seasonal variations in the catch as also the differential composition of the catch under each species.

Major Exporters and Importers

Japan ranked as the top exporter of fish, mostly canned products, worth $ 286 million (478,000 tonnes) during 1968. She will, however, continue to be an important importer of a variety of fish products, her present per capita consumption at 27.7 kg. being the highest in the world. Peru, the world's largest producer of fish, was second with an export turnover of $ 232 million (2.41 million tonnes), mainly of fishmeal, which is a low-value item. Canada stood third with $ 227 million (394,000 tonnes), her exports being mainly of fresh and frozen fish and lobsters. Norway figured next in importance with exports of $ 216 million (819,000 tonnes), mainly of fishmeal and frozen & cured fish. Denmark's exports totalled $ 136 million (497,000 tonnes), mainly of fresh & frozen fish and fish meal. Mexico and India, the two foremost global shrimp exporters, netted $ 61 million (33,000 tonnes) and $ 27 million (24,000 tonnes) respectively.

USA, one of the world's leading fish catching nations, has been the largest importer of marine products over the past many years, her imports having aggregated to $ 718 million (1.55 million tonnes) in 1968. UK ranked as the second largest importer of seafoods worth $ 277 million (965,000 tonnes) followed by West Germany, France, Japan and Italy.

MARINE FISHERY POTENTIAL AND UTILISATION

The world oceans have an estimated fishery potential of 118 million tonnes against which the total marine catch in 1968 stood at 56.6 million tonnes. The average yield per sq. km. of the Atlantic, Pacific and the Indian oceans has been placed at 0.17, 0.14 and 0.03 tonne respectively during 1966-68. The major reason for the low yield of the Indian ocean has been ascribed to inadequate exploration and fishing restricted to the inshore areas upto 10 fms, excluding off-shore and deep sea fishing beyond 10 fms and 40 fms respectively.

India currently exploits only a small portion of fishery potential of the Indian seas. Out of the present fish landings of India at 933,000 tonnes in 1968, about three-quarters of marine fish occur from the west coast of India although investigations and studies have indicated vast potential of shrimp, lobsters and perches on the east coast. Various exploratory surveys have revealed that a potential of 8 to 11.8 million tonnes exists in the Indian ocean. The additional resources available for fishing around the Indian coasts have been estimated as follows:

	(Million tonnes)
Inshore area (upto 10 fms)	0.21
Off-shore area (10 fms - 40 fms)	0.60
Deep sea area (beyond 40 fms)	1.80
High sea area	0.25

India's Position

Whereas marine fish landings of the world have shown an upward trend from 36.5 million tonnes in 1961 to 56.6 million tonnes in 1968, or at an average annual growth rate of 6.5 per cent, those of India have correspondingly risen from 684,000 tonnes to 933,000 tonnes, or only by 4.6 per cent. The major factor for the slower rate of increase in India's fish production has been under-exploitation of the rich potential of the Indian seas and especially the off-shore and deep sea regions of the Arabian Sea and the Bay of Bengal, owing, among others, to meagre infrastructural arrangements, such as, fishing harbours and landing & berthing facilities, non-availability of large fishing vessels for deep sea and high-sea operations and storage & processing capacity, which are referred to in detail in the paragraphs that follow.

Nevertheless, the Indian seafood industry has registered an impressive growth in exports from $ 10.20 million (21,000 tonnes) in 1961 to $ 26.91 million (24,000 tonnes)in 1968, or at an average annual growth rate of 14.9 per cent, as against the rise of world exports from $ 1,280 million (4.45 million tonnes) in

MARINE FISH LANDINGS IN INDIA: 1959 – 68 (Annual Average)

(By Groups of Species)

TOTAL: 786, 000 Tonnes

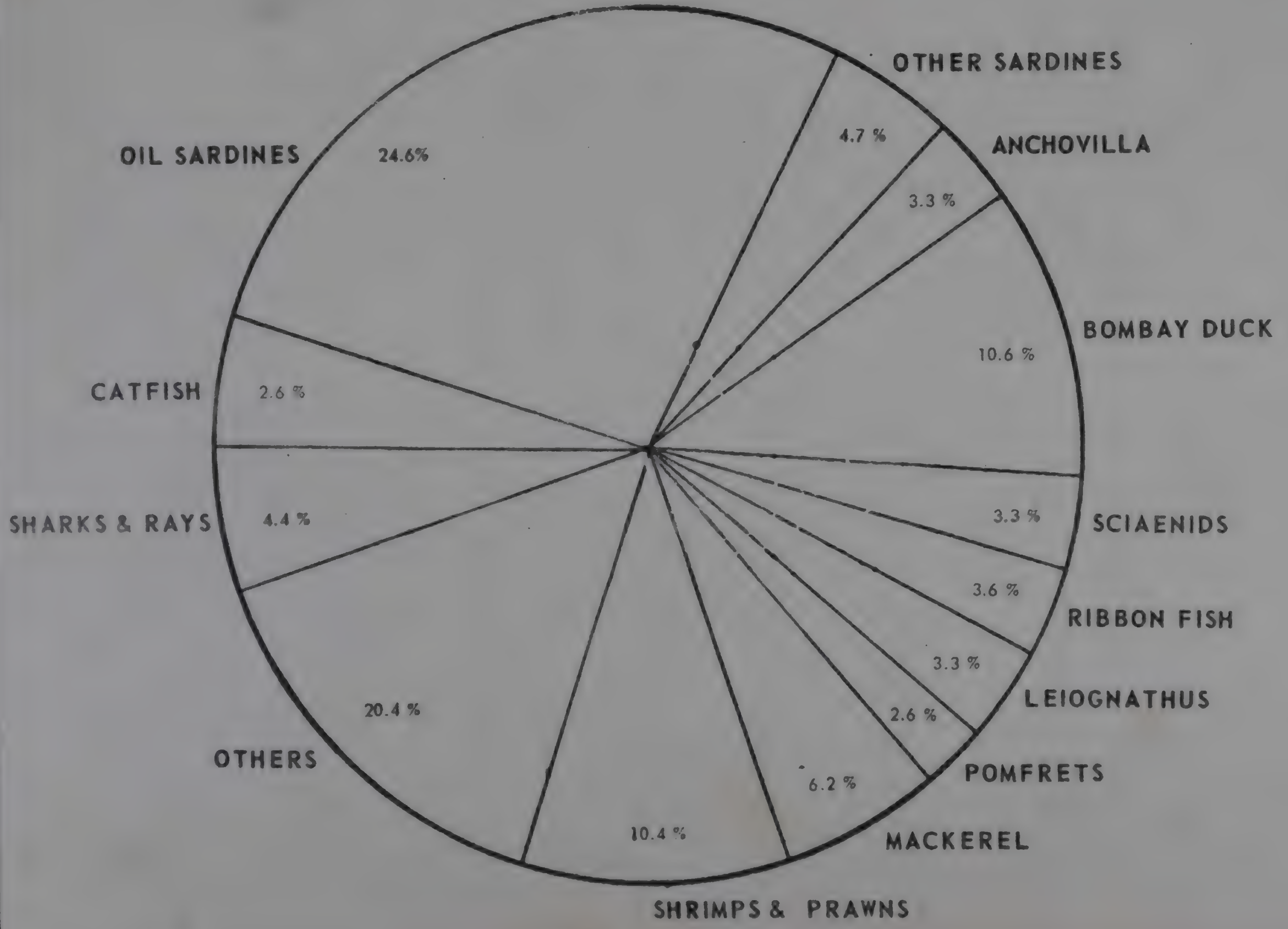

Chart – 1

1968, recording an increase of 8.2 per cent. This level of export performance can be maintained and, in fact, improved upon by systematic exploitation of the rich potential of the Indian seas, where some of the large fishing vessels and trawlers of USSR, Japan, South Korea and other countries have been operating for shrimp and tuna to India's disadvantage.

Structure of the Fishery Industry in India

An idea of the structure of the marine products industry in India as of 1968 can be had from the following:

Fishing Fleet	Nos.
Indigenous craft	94,000
Small mechanised boats (6 m to 12 m)	7,600
Large vessels (13.0 m to 27 m)	49

Of these, a large number of indigenous craft operate off the coast of Tamil Nadu (30,000), Andhra Pradesh (21,000), Kerala (22,667), and Maharashtra (8,382). The major concentration of small mechanised boats is, however, to be found in the coasts of Maharashtra (2,393), Gujarat (1,709), Kerala (1,738), and Tamil Nadu (966).

The freezing and canning capacity in the country are estimated to be of the order of 59,000 and 11,440 tonnes respectively in 1968. About 83 per cent of the total freezing capacity of 48 units, and 85 per cent of the total canning capacity of 42 units are concentrated in Kerala. Besides, of all the 168 exporters, as many as 114 are situated in Kerala. Ninety export firms of Kerala are responsible for 84 per cent of the total seafood exports. Other centres of importance in respect of exports are Bombay, Mangalore and Madras, which have facilities of freezing and canning as well.

FISHERY DEVELOPMENT PROGRAMMES

Fishery Projects

Based on the known and estimated potential of the country, a comprehensive and integrated programme for the development of major fisheries like shrimp, lobsters, sardines, mackerel, Bombay duck, eel and tuna capable of realising high unit values in the export market has been worked out for the next decade. Twenty-six fishery project proposals taking into account the available species and the existing and planned infrastructural facilities have been suggested for maritime States, Union territories of Goa and Andaman and Nicobar and Laccadive Islands. The structure of these projects is derived from the commerically viable model fishery projects integrating all activities from fishing to marketing computed for each maritime State. These projects are listed in Part B of this Volume.

The various project centres have been selected for fishery development on the basis of the following major considerations:

(a) Commercial profitability of the project;

(b) Fuller utilisation of the existing facilities of infrastructure and the available processing capacity in different areas;

(c) Intensive and extensive exploitation of fishery resources in the known as well as new fishing grounds;

(d) Processing of new products for export;

Whereas the detailed investment outlays envisaged for the 26 centres and the likely annual export earnings by 1978-79 are indicated in Annexures A3 & A4 the overall position as estimated by the Survey Team is summarised in Table A-2.

Table A-2

Investment and Anticipated Export Earnings

(Rs Million)

	Investment	Foreign Exchange Component
Vessels	905.83	60.12
Processing Facilities	106.93	34.48
Total	1,012.76	94.96
Annual Export Earnings by 1978-79	822.61	

In addition to the export earnings of Rs 822.61 million from the above mentioned fishery projects, the existing centres are anticipated to generate export earnings of the order of Rs 357.39 million, thereby bringing the total annual earnings to Rs 1,180 million by 1978-79. Of Rs 1,012.76 million capital investment envisaged for fishery projects over a ten year period the foreign exchange component involved will be of the order of Rs 94.60 million as indicated above, constituting about 9.3 per cent of the total outlay. The import content of the programme for investment in processing facilities involving foreign exchange worth Rs 34.48

million consists of machinery and equipment for special packing (IQF), sorting, grading, peeling, nitrogen freezing etc. It is envisaged that a minimum of 60 large vessels - 45 of 22 m (metre) size costing Rs 28.62 million and 15 of 27 m size costing Rs 31.5 million - involving foreign exchange equivalent of Rs 60.12 million will need to be imported in the first two-three years of the programme. However, the possibility of procuring a large number of vessels under the proposed joint venture scheme should be explored. This would not only generate foreign exchange earnings but accelerate the programme for exploitation of deep sea fishing within a period of six months and re-orient the designing and construction programme of ship-building in Indian yards.

Fleet Composition of the Fishery Projects

In all 3,560 additional fishing vessels are proposed by the Survey Team for introduction during the next ten-year period for operation in the various fishery projects. The sizewise composition and Statewise distribution of these vessels are indicated in Table A-3.

Table A-3

Distribution of Proposed Fishing Fleet

(Centre and Size-wise)

Name of State	Area	Nos.					Total	
		11.1m	13.8m	17.5m	22.0m	27.3m	No.	Rs million
Gujarat including Diu-Daman	Kandla	-	-	-	4	3	7	12.00
	Veraval	400	-	20	10	-	430	80.00
Maharashtra	Bombay	250	-	44	14	7	315	99.25
	Ratnagiri	240	-	-	-	-	240	30.00
Goa	Marmagoa	75	-	-	-	-	75	9.00
Mysore	Karwar	35	9	6	-	-	50	10.73
	Malpe	150	18	12	-	-	180	31.85
Kerala including Mahe	Cochin	-	-	21	14	20	55	76.75
	Vizhinjom	400	-	18	14	18	450	118.50
Tamil Nadu including Pondicherry & Karaikkal	Tuticorin	400	-	20	10	20	450	130.00
	Madras	500	-	20	10	20	550	145.00
Andhra Pradesh	Visakhapatnam	60	-	30	-	10	100	50.00
	Kakinada	100	-	-	-	-	100	12.00
Orissa	Chandnipal	150	-	-	-	-	150	18.00
West Bengal	Roychauk	75	-	9	9	-	93	29.25
Andaman & Nicobar Island	Port Blair Diglipur Katchall	100	-	10	-	5	115	29.50
Laccadive Island	Minicoy	200	-	-	-	-	200	24.00
Grand Total		3,135	27	210	85	103	3,560	905.83

Fishing, at present is mostly carried on in in-shore waters upto 10 fms by traditional wooden crafts and small mechanised boats of 11.1 m. These boats cannot operate in off-shore waters (10 to 40 fms and beyond) except upto 15 - 20 fms by 13.8 m vessels. For off-shore waters medium (15.2 to 18 m) and large size (22 to 27 m) vessels can operate upto 40 fms whereas large size vessels are necessary for deep sea areas. For intensive as well as extensive exploitation of fishery resources of the inshore belt, introduction of small category of vessels numbering 3,162 are recommended at different centres, excluding in Kerala and Kandla. As the in-shore area of Kerala is sufficiently exploited by small boats, no additions are suggested for shrimp fisheries. At Kandla these types of vessels are not advisable as they cannot operate on account of strong tidal current.

For exploiting potential resources in the off-shore areas, introduction of 210 medium size vessels (17.5 m) are recommended at various centres. For undertaking deep sea fishing off the coast of Kerala and Tamil Nadu 66 and 60 large vessels (22.0 and 27.3 m) respectively are proposed for introduction specially for the exploitation of shrimp, lobsters, breams and perches. Other areas for deep sea fishing where a beginning has to be made both on the west and east coasts are also indicated in the preceeding table.

Item-wise additional exports which are likely to be generated annually by 1978-79 with the introduction of the vessels mentioned above at various centres on east and west coasts are indicated in Table A-4.

While the overall contribution of the west coast will be higher in volume and value of exports, the east coast is expected to have an edge over the west coast in the unit values of shrimp, lobsters and sardines on account of the relative advantages in size and quality.

Commercial Profitability

Commercial profitability* in respect of the major proposed fishery projects, worked out by the Survey Team on the basis of constant prices, is given in Table A-5.

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* It is the internal rate of return, defined here as the rate of interest which yields, in terms of present worth, the future sums of profits over the life of a project, equivalent to investment made on it. Details of computing commercial profitability appear in Part B of this volume (See pp. 283-286)

Table A-4

Estimated Exports of Marine Products by 1978-79

Qty: Tonnes
Val: Rs million

Item		East Coast	West Coast	Total
Shrimp, frozen, canned and dried	Q	17,280	17,680	34,960
	V	311.70	230.71	542.41
Lobstertails, frozen	Q	225	2,290	2,515
	V	4.70	39.25	43.95
Fish, frozen	Q	11,000	11,330	23,230
	V	34.50	33.99	68.49
Sardines, canned	Q	10,900	17,400	27,400
	V	30.00	53.31	85.31
Bombay Duck	Q	-	3,100	3,100
	V	-	14.40	14.40
Mackerel, canned	Q	-	5,854	5,854
	V	-	27.14	27.14
Tuna, canned	Q	-	1,200	1,200
	V	-	7.20	7.20
Eel, canned	Q	-	1,200	1,200
	V	-	13.80	13.80

Table A-5

Commercial Profitability of the Fishery Projects

State/Union Territory	Centre	Commercial Profitability (Percentage)
West Coast		
Gujarat	a) Veraval	23
	b) Kandla	28
Maharashtra	a) Sassoon Docks (Bombay)	15
	b) Ratnagiri	32
Goa	Marmagoa	25
Mysore	a) Karwar	22
	b) Malpe	26
Kerala	a) Cochin	22
	b) Vizhinjom	21
East Coast		
Tamil Nadu	a) Tuticorin	28
	b) Madras	24
Andhra Pradesh	a) Visakhapatnam	44
	b) Kakinada	over 50
Orissa	Chandnipal	over 50
West Bengal	Roychauk	over 50
Andaman & Nicobar Islands	a) Port Blair	4
	b) Diglipur	
	c) Katchall	
Laccadive Islands	Minicoy	loss

In arriving at fixed investment and cost of operation for each project the following assumptions have been made:

a) Supply of vessels at international prices and on deferred payment terms;

b) Supply of fuel for the vessels without excise duty;

c) Adequate availability of infrastructural facilities.

It will be seen from the above that profitability varies between 15 to 32 per cent in the projects of west coast. The projects at Kandla and Ratnagiri show high profitability on account of the availability of large quantities of sardines and mackerel in waters off Kandla and shrimps and lobsters at Ratnagiri. The relatively low profitability shown by projects at Sassoon Docks (Bombay) and Vizhinjom is due to high capital investment involved in the composite units.

On the east coast however profitability ranges between 24 to over 50 per cent. The high profitability indicated by projects at Visakhapatnam, Kakinada, Chandnipal and Roychauk has been atrributed to relatively lower investment on boats and the present availability of shrimp off deltaic areas from outside sources at low prices. However, this position is likely to change, once processing industry develops at these centres.

The project at Andaman and Nicobar Islands has low profitability and the one in Laccadive Islands shows loss largely on account of high cost of fuel which has to be supplied from the mainland. This should not deter the fishing operations in these areas as they are replete with quality fish like tuna and lobsters, which are high unit-value earners.

FINANCIAL REQUIREMENTS AND INVESTMENT PATTERN

Fisheries have been accorded high priority in the Five Year Plans in view of the growing protein requirements and exports. The indications of Plan outlay and actual expenditure during the Plan periods and the proposed outlay for the Fourth Plan are given below:

(Rs million)

Plan	Plan Outlay	Actual Expenditure
First Plan (1951-55)	51.30	27.80
Second Plan (1956-60)	122.00	90.00
Third Plan (1961-65)	285.80	233.80
Fourth Plan (1969-73)	835.70	..

Development of fisheries over the different plan periods has broadly been concerned with mechanisation of fishing boats for increased marine fish catch, providing landing and berthing facilities for such boats, for exploitation of the seas, for locating fishing grounds for intensive and commercial fisheries. Emphasis was also laid on the installation of ice plants, cold storages, provision of refrigerated rail and road transport, establishment of fishery cooperatives and arrangements for research and training facilities.

Details of the outlay proposed by the Survey Team for the various schemes are given in Table A-6.

Table A-6

Development of Fisheries in the Fourth Plan

(Rs million)

Item	Survey Team's Suggested Outlay		
	Governmental	Institutonal	Total
Fishing harbour	225.25 (Central Govt.)	-	225.25
Deep Sea fishing	190.76 (Central Govt.)	320.49	511.25
Mechanisation of fishing boats	99.59 (State Govt.)	298.77	398.36
Processing plants	-	106.93	106.93
Other schemes, including exploration, training research, inland fisheries	310.50	-	310.50
Total	826.10	726.19	1,552.29

The Survey has recommended an outlay of Rs 225.25 million as against Rs 170 million provided by the Planning Commission for fishing harbours in view of the urgent need to complete the landing and berthing facilities in centres where work has already been commenced or planned to start. It has also recommended increased provision for deep sea fishing and a lower allocation for programme of mechanisation of small fishing boats in view of the need for exploitation of off-shore and deep sea fisheries. Besides, the Survey envisages substantial contribution in the investment programme, as indicated above, during the Fourth Plan, from financial institutions like Industrial Development Bank of India, Agricultural Refinance Corporation, Agricultural Finance Corporation and commercial banks. Of the suggested outlay, the contribution of the Government will have to be of the order of Rs 826.10 million and from the institutional finance Rs 726.19 million. A sum of Rs 905.83 million will be earmarked for fishing vessels of which about 75 per cent will be met by institutional finance. The operators of fishing vessels will contribute about 15 to 20 per cent of the cost of large vessels at international price and the Government of India will have to bear only the cost of subsidy, being the difference between the cost of vessels built in the country and international price of similar vessels. The Government of India have, it is understood, recently agreed to provide 25 per cent subsidy on the cost of fishing vessels (17.5 m and above) built in India, which according to the Survey appears to be on the lower side.

Deep Sea Fishing

The Survey has highlighted the need for mobilizing and intensifying efforts in the area of deep sea fishing which would involve introduction of 398 large fishing vessels of medium and large size and 3,162 small boats at an estimated cost of about Rs 905 million. The import of 60 out of 398 vessels at an estimated cost of Rs 60.12 million has also been recommended in the initial two to three year period.

Of the 398 fishing vessels, 210 vessels of 17.5 m will have to be constructed in the country over the next five years. Of the remaining 188 vessels of sizes 22 and 27 m, 60 vessels may be allowed to be imported as part of the joint venture programme and for selected companies in the country for expanding their activity. On gaining experience from the operations of these vessels, it should be possible for drawing up detailed designs and construction programme in the country for the remaining 128 vessels. Till such time the Indian ship builders are in a position to construct them at international prices, the Government of India should subsidise the larger fishing vessels built in the country for the fishing vessel operators. This subsidy should be to the ship building yards and not to the fishing industry. It is, therefore, necessary to consider whether this amount, Rs 190.76 million, is to be met from the fisheries sector or from the ship building sector.

The programme of bringing in deep sea fishing vessels under joint ventures will facilitate the work in the projects, as they could be commissioned within three to six months and start earning foreign exchange immediately and also give the necessary initial advantage for training and organising the commercial projects.

Investment Pattern for the Next 10 Years

In order to achieve the level of export performance, the total investment required would be of the order of Rs 1,472.03 million, including the outlay of Rs 435.42

million for fishing harbours. It also includes the funds to be made available from institutional finance for capital items such as fishing vessels, processing plants, etc. The investment of various Central and State Governments as well as financial institutions over a period of 10 years is as follows:

Source of Investment	Investment (Rs million)
Government of India	646.25
State Governments	99.59
Financial institutions	726.19
Total	Rs 1,472.03

The sum of Rs 646.25 million to be invested by the Government of India includes a sum of Rs 435.42 million for fishing harbours of which Rs 170 million has already been provided in the Fourth Plan for these services. It also includes a sum of Rs 190.76 million as subsidy for making available the indigenously built large fishing vessels at international prices. Besides, provision has been made for refrigerated rail transport (Rs 17.50 million) and subsidy on interest (Rs 2.57 million) payable on loan finance.

Joint Ventures

Based on the experience of most of the countries with developed fisheries, the Survey Team strongly recommends the need for joint ventures in India for some of its fisheries like, shrimps, lobsters, tuna and skipjack which have great potential but lack necessary investment resources and other facilities for development in the immediate future. Mexico, Thailand, Panama, Iran, Nicaragua and Brazil are some of the many countries which have capitalised on their shrimp and tuna resources by entering into joint collaboration arrangements with countries like USA and Japan.

Joint venture arrangements on product sharing basis facilitate and accelerate the programme of deep sea fishing with improved types of vessels, designs and techniques of fishing suitable to local conditions. According to the arrangements, the foreign investor brings in the equipment and the technical personnel within a period of 3 to 6 months to commence commercial fishing operations with the least possible delay in areas where the fisheries are international, i.e., anyone can fish in these areas. If immediate steps are not taken to exploit deep sea fishery resources, it is likely that the modern fishing vessels of other countries capable of wide range operations will continue to take the advantage of the fishery potential beyond territorial limits of Indian waters. Although deep sea fishing has been accepted as one of the priority industries for foreign collaborations in 1969 by the Government of India the terms and conditions necessary for the purpose have not yet been drawn up for the benefit of the interested parties in India and abroad. It is, therefore, necessary to lay down broad terms and conditions for joint venture enterprises between local and foreign parties for undertaking fishing operations, processing and export marketing.

PROBLEMS OF PRODUCTION

Fishing Harbours

Fishing harbours with adequate facilities for landing and berthing of fishing vessels, handling, processing and marketing of fish and supply of essential requirements including repair and maintenance facilities for the economic and efficient operation of fishing vessels are the basic necessity for the fishing industry. These facilities are at present available only at a few centres in India. Based on the fishery potential in different regions and the need for providing basic shore facilities, the Survey Team has estimated the investment requirements of these facilities in the proposed 26 centres at Rs 329.42 million and Rs 106 million by 1975-76 (priority I) and 1978-79 (Priority II) respectively. When completed they will provide landing and berthing facilities to the existing and the additional fleet of 3,560 small and large fishing vessels capable of landing 578,000 tonnes of marine fish annually, important varieties of which can be processed and exported to earn additional foreign exchange worth Rs 822.61 million. These facilities will also attract additional quantities from neighbouring areas for processing for export of seafoods valued at Rs 357.39 million during the ten year period.

The cost of construction of these fishing harbours, being essentially of the nature of development expenditure for strengthening the base of the country's economy should be met by the Government of India, where necessary, with financial assistance from international agencies like IBRD and Asian Development Bank. The provision of ancillary facilities like ice and cold storage, processing, transport, etc., will need to be provided by the State Government/commercial agencies and administrative control vested in the port authorities.

It is also necessary that ship to shore communications are provided to a large number of bigger vessels proposed to be introduced during the next few years besides making adequate arrangements for road, rail and water transport for the transportation of fish from landing centres to the processing plants.

Fishing Fleet

It is necessary that the implementation of the programme of craft mechanisation and introduction of large vessels for exploiting the off shore and deep sea resources are achieved in the following planned phases:

i) Motorization of country crafts and the introduction of small mechanised boats in areas which are under-developed;

ii) Introduction of large and more specialised vessels for deep sea and off-shore fishing areas;

iii) Broadening the fishing fleet with partial processing at sea.

Investigations undertaken by the Central Marine Fisheries Research Institute off Kerala inshore waters have indicated a reduction in the catch per unit of effort and slight decline in the size of the shrimp. The total quantity of shrimp landed in this area has also been steady at an annual rate of about 30,000 tonnes. It would, however, be wrong to say that the area is being overfished: for overfishing sets in where fishing has been carried to the point when the marginal cost of a unit of fishing effort exceeds the marginal revenue obtained from the resulting catch. This contingency has not yet occurred in this area. As such no conservation measures are called for at this stage. It, however, seems necessary to discourage introduction of additional units of small mechanised fishing vessels in this region for shimp unless future investigations indicate an encouraging trend but the base for small vessels for other fish like sardines and mackerels needs to be strengthened. Efforts should, therefore, be directed on the west coast for an immediate introduction of medium and large sized shrimp trawlers to start fishing in the off-shore waters beyond 20 fms. While the small boats suggested are largely for operation on the east coast and Saurashtra and to some extent for replacement of obsolete boats by 1973-74, the introduction of 398 medium and large vessels needs to be phased over a period of next 10 years.

With a view to undertaking deep sea fishing as early as possible and to take advantage of the latest equipment and available technical know-how, the Survey Team suggests that 210 vessels of 17.5 m size should be constructed locally. Import of large vessels, however, of 22 m and 27 m should be allowed under joint collaborations with selected foreign fishing companies till the end of 1972. Such an arrangement will not only introduce commercial fishing in off-shore areas within a period of six months and start contributing to the foreign exchange earnings almost immediately but will also accelerate the introduction of new designs of fishing vessels in the country paving the way for initiating indigenous construction. A shrimp trawler of 22.8 to 25.9 m (75 to 85 ft.), can contribute to earning of foreign exchange of $ 200,000 a year and can be amortised within a period of two to three years. The operation of such trawlers will also quicken the pace of construction of similar trawlers in the country.

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Construction of Fishing Vessels

As adequate boat building capacity exists locally for the construction of vessels upto 17.5 m, import of these vessels should be discouraged. The yards should effect necessary improvements in the design and reduce the cost of production of 17.5 m vessels by concentrating boat building in two or three yards. The only way of reducing the cost of construction is to encourage the boat builders to specialise and undertake large scale production of 17.5 m trawlers to meet orders from neighbouring countries with the understanding that they would be allowed duty free import of machinery or components which they might require for the construction of these vessels for sale outside India.

Cost of Vessels

The cost of boats in India particularly of steel vessels is high compared to the cost of similar vessels in other countries. In order to encourage the fishing companies in India to take to larger vessels for deep sea fishing, it is necessary to make available larger steel vessels at international prices and on easy payment terms.

The Survey has estimated that for the introduction of 398 medium and large fishing vessels proposed during the next 10 years, the extent of foreign exchange component for the import of 60 vessels and the subsidy for 338 vessels will be of the order of ₨ 60.12 million and ₨ 190.76 million respectively. In a number of maritime countries like USA, Canada, UK, Japan, Taiwan and Korea such financial assistance is made available to the fishing industry.

Marine Diesel Engines

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The capacity for the manufacture of low revolution marine diesel engines in the country is inadequate at present. The cost of indigenous engines is relatively higher than that of imported engines, the difference in certain cases being as much as 100 per cent, thereby affecting the cost of production of the finished products. It is recommended that import of engines on a quota basis over a period of 2 to 3 years be allowed to ease the supply position of marine diesel engines in the country. This will also induce the local manufacturers to effect improvements in the quality of indigenous engines to meet the special and rigid requirements of the fishing crafts.

Fishing Gear

There is an urgent need for bringing about improvements in the fishing gear in India as has been done in other maritime countries. Application of improved types of fishing gear has contributed to increased catches of fish by extending the area of operation. For example, night fishing in Gulf of Mexico has resulted in increased landings of shrimp by 15 to 20 per cent. The possibility of organising tuna and skipjack fishing on large scale with lines and purse-seining in collaboration with some of the fishing companies from Japan and USA offers great scope in Laccadives and off Cochin, Goa and Veraval on the west coast and Tuticorin and Visakhapatnam on the east coast. Similarly, pelagic fish like sardines and mackerels can be exploited by purse-seining with the aid of power blocks.

Diesel Fuel

The fishing industry being highly export-oriented, it is desirable that diesel oil in India is supplied duty free to increase the number of fishing hours, duration of fishing trips and the range of fishing areas. The price of fuel in India compared to other countries is the highest and the fuel expenses constitute as much as 30-40 per cent of the total cost of boat operation. In countries like Venezuela, USA, Canada and Mexico the respective prices of diesel fuel are only 18 per cent, 28 per cent, 32 per cent and 35 per cent of that of India. This high price differential is reflected in the production cost of raw material thereby affecting the competitiveness in the international markets. Diesel oil in other countries is supplied at bonded rates to the fishing vessels. The extent of loss of revenue to the Exchequer on account of the duty free supply of diesel oil to the fishing vessels, as suggested by the Survey Team, is quite negligible compared to the foreign exchange earnings from fish and shrimp landings of each vessel. In the absence of the proposed relief, the requisite number of fishing vessels are unlikely to be attracted into fishing activity.

Man-power Requirements

The Survey revealed that there is an acute shortage of trained technical personnel particularly of certificated skippers, fishing second-hands, engineers (fishing vessels) and the deep sea drivers. In the immediate future, the position is likely to become more acute with the commissioning of large number of bigger trawlers by the commercial fishing operators. The shortage of fishing skippers, second hands, drivers, etc. is mainly due to the requirements prescribed under the Indian Merchant Shipping Act, 1958. It is necessary that separate rules are immediately framed for the fishing vessels under the Indian Merchant Shipping Act, 1958, to register fishing boats and recognise the certificates issued by the Fishermen Training Centres and by the Central Institute of Fisheries Operatives for the various categories of personnel according to classification in the Act.

PROBLEMS OF PROCESSING

Processing of seafoods in the frozen and canned forms commenced in India in 1953 and 1959 respectively. Since then, the industry has expanded rapidly. Of the existing freezing and canning capacities, reckoned at 59,000 tonnes and 11,440 tonnes respectively only 25 and 19 per cent respectively are currently being utilised against the economic utilisation of about 50 to 60 per cent of the installed capacity. The characteristic feature of the processing industry in the country is that although more than 80 per cent of the fishing is spread over a period of 6 to 8 months, the peak season lasts only for 3 to 4 weeks at a stretch when the catch is adequate enough to use the entire processing capacity.

The large unutilised capacity in the processing sector is primarily due to shortage of raw material. Against the total potential demand of 162,000 tonnes of raw material (118,000 tonnes for freezing and 44,000 tonnes for canning) the availability of export varieties of prawns, lobsters and froglegs was only of the order of 58,000 tonnes in 1967. Another reason for under-utilisation of capacity is the existence of multiplicity of processors who try to reduce the burden of large overheads and fixed investments, by leasing or hiring out the idle capacities available at their plants. Since only working capital is required to take advantage of this facility and as no licence is needed for such an establishment under the existing system, new comers are easily attracted resulting in mushroom growth of processors and exporters. The entry of such units without processing facilities is largely on account of the buoyancy in the export market and many of them disappear when the export market becomes unfavourable. Until then, however, they offer unhealthy competition to the established firms in the procurement of scarce raw materials. It is, therefore, extremely important to subject the seafood processing industry in India to some sort of control and discipline by a centralised Agency as has been done in other countries to regulate, develop and re-organise their fishery industry.

With a view to bringing regional balanced development, the Survey has recommended the installation of plants for undertaking processing and export of various varieties of fish like Shrimp, Bombay Duck, Lobster Tails, Sardines, Mackerel, Tuna, Fishmeal and Fish oil from various centres like Mangalore (Mysore), Cannanore and Calicut (Kerala), Umbergaon (Gujarat), Versova (Maharashtra) and Mandapam (Tamil Nadu) which at present remain comparatively less developed. The cost of processing facilities to be established at these centres, taking into consideration the existing capacity and facilities, has been estimated at Rs 106.93 million including foreign exchange component of Rs 34.48 million.

Product Development and Diversification

At present only three major shrimp varieties processed in India are: (i) headless shell-on (ii) peeled and deveined fresh or frozen, and (iii) cooked frozen. Although the types of processing employed in India are similar to those carried out in other shrimp processing countries, the types of pack differ considerably. While most of the foreign countries have adopted different packing methods to suit market requirements, Indian producers still adhere to the traditional block processing. In USA, Mexico and Central and South American countries almost the entire large size shrimp is processed in the individually quick frozen form (IQF).

The Survey has revealed that there is immense scope for product diversification to meet the changing pattern of overseas markets. It is necessary that the Indian processors should switch over to new and modern methods of processing to suit the requirements in the international markets. For instance, had 50 per cent of 22 million lbs of shrimp exports of India to USA in 1968-69 been processed in IQF form, India would have realized Rs 25.5 million more in terms of foreign exchange besides saving a substantial amount of freight and packing charges.

At present frozen and canned shrimp, frozen lobster tails and froglegs, constitute the principal items of marine products exports. There is considerable scope for increasing the range of speciality products from fish and shell fish, like shrimp extract, prawn paste, tuna paste, mackerel and sardine paste, fish flakes, fish soup mix, and crab concentrates to the export markets. For instance, the European markets hold excellent prospects for fish and shrimp extract, fish pastes and other preparations. USA is another important market for forzen fish, fish flakes and 'convenience' foods and snacks.

Compulsory In-plant Inspection

The quality control and inspection system as it exists today in India is applicable only at the stage of pre-shipment. In countries like Mexico, Canada, Japan, South Korea, Norway and UK, strict quality control and inspection systems obtain at all stages from landings through various stages of processing till the products are exported. In Mexico, the individual plants exercise their own rigid control without any State regulation to produce goods to meet the exacting requirements of the importing countries.

The Survey has revealed that at present only few processing firms in the country observe strict hygienic schedule, producing quality items with regard to organoleptic and bacteriological tests. Besides, substantial quantity of the raw material is supplied to the processing plants by the peeling sheds which are not built according to specific designs and are therefore found wanting in requisite hygienic standards presumably affecting the quality of the final product, particularly when there is no inspection now at the processing stage. However, it must be stated that the quality control and inspection system of India has in some measure contributed to the export promotion of marine products. Nevertheless, there is an urgent need for broadening and strengthening the present inspection system, backed by necessary research and technical know-how to include bacteriological standards of all fishery products, longer incubation and sterility tests for canned goods, hygienic standards for peeling sheds and processing units, specifications of cans, master cartons, labels and other packaging materials.

Such an in-plant inspection system will not only create more confidence in the Indian products but also will cause an increase in unit value realisation.

The urgency of broadening and strengthening the present inspection system can be appreciated against the background that of the 8 Bills pending consideration at different stages in the US Congress, the Hart Bill (S.10925, introduced in the Senate on February 19, 1969) aims to bring processed fishery products, internal and external, under mandatory inspection. When enacted, this legislative measure might make it compulsory for any processor to obtain a licence of fitness from the Food & Drug Administration of USA.

Mechanisation of Processing

In India various processes like beheading, grading, sorting and peeling involved in the processing of shrimp are performed manually unlike in other countries such as USA, Japan, Canada and Mexico, where the operations are mechanically conducted to produce quality product in hygienic conditions and at comparatively low cost of production, notwithstanding the initial investment. In order to compete effectively in the international markets and to realise higher unit value for its products, the Indian processing industry should be encouraged to introduce mechanisation at various stages of processing to prevent unnecessary handling and ensure proper grading. The import of machinery for grading, sorting, peeling, and IQF preparation required for undertaking such processes should be permitted till such machinery is manufactured locally.

PROBLEMS OF EXPORT MARKETING

The bulk of marine products is at present exported to five principal markets, namely USA, Japan, Ceylon, UK and France. The export products mainly constitute frozen shrimp, frozen lobster tails, frozen froglegs and canned shrimp. Exports of items like prawn pickles, frozen fish, beche-de-mer, cuttle fish, shrimp powder, turtle meat and fish oil constitute small quantities at present. Since the competition in the main markets such as USA and Japan is intense, diversification of markets and products can be attempted with advantage by the Indian industry. For example, Canada offers a good market for frozen shrimp, the main suppliers at present being USA, Hong Kong, Cuba, Mexico and Japan. There is also scope to export increasing quantities of frozen and canned shrimp and frozen lobster tails and froglegs to UK, France, Denmark, Sweden, Norway, West Germany and other continental countries.

With the anticipated increase in landings of fish in India and the emergence of new markets in the USA, Europe and Japan, canned items like tuna, skipjack, sardines, mackerel, eel and other important varieties of fish produced at competitive cost and according to the market preference, promise great scope for export.

Marketing Practices

At present, most of the frozen shrimp is marketed on consignment basis. It is essential for the Indian seafood trade and industry to undertake direct marketing as is done by some leading fish exporters like Mexico, Venezuela, Australia, New Zealand and South Africa. These countries have their own organisations particularly in USA for marketing their products directly and effectively, on the basis of their intimate knowledge of the specific requirements of the consumers.

The large exporters of India have established contacts with agents and processors in USA over a fairly long period and are quite satisfied with marketing their products on consignment basis. However, the medium and small exporters are in a relatively disadvantageous position in their dealings with the overseas importers with their limitation to supply quality products at regular intervals, in adequate quantities and of uniform grades with satisfactory packaging. Exports to countries other than USA, are however effected on an out-right sale basis. The Survey emphasises the need for exporting seafoods increasingly on direct sale system. It also recommends the formation of a common agency for organising the export marketing effort of both small and medium exporters.

Inter-se Competition and Multiplicity of Brands

Some of the major supplying countries are marketing their products, through a limited number of common brands. The shrimp industry in Mexico, for instance, has evolved a system of marketing through two agencies namely, the Ocean Garden company and Crest Importing company, under the respective brand names of 'Ocean Garden' and 'Crest' in the US market. South African lobster tails are also sold through a common organisation under a limited number of brand names. The Survey highlights the urgent need for the seafood industry to explore the possibility of promoting a few common brand names with a view to projecting a sound image of Indian products abroad and increasing unit value realisation.

There are at present 168 exporters in the country 83 of whom are merchant exporters depending on hired or leased processing facilities. Some of these merchant exporters have little stake in the business as they do not have any fixed capital investment and operate with slender financial resources by taking advantage of packing credit available from commercial banks and the facility of drawing liberally against the Letter of Credit opened by the importers. They are in business as long as conditions are favourable and would not hesitate to drop out even in the face of prior overseas commitments. As long as they are in business, they offer unhealthy competition to the established exporters by overbidding the raw material prices at home, and by being indifferent to the realisation of competitive prices abroad. Some of them are also ill-equipped to supply uniform quality and honour delivery schedules. Thus the image of the Indian seafood products is being distorted in the overseas markets. A suitable code of conduct should therefore be enforced through agencies like the Seafood Exporters' Association of India and the Marine Products Export Promotion Council.

Price Realisation

The representative wholesale price data for frozen shrimp, published from time to time in the 'Green Sheet' indicate that the prices realised by the Indian shrimps for comparable grades are on an average 10 to 15 cents per lb. less than those of competing countries in the US market. The major factors responsible for the low unit value realisation, in brief, are explained below.

Blocks vs IQF and 'Ready to Cook' Items. Most of the shrimps exported by India to the US market are in 5 lb. blocks in green headless shell-on or in peeled & deveined form. The overseas processors who import shrimps thaw them out for preparing frozen breaded shrimp, IQF, peeled & deveined shrimp and similar processed items since most of the ultimate consumers in the US market prefer 'ready to cook' foods. India's processors and exporters of shrimp can realize at least a minimum of 50 cents per lb. more by exporting shrimp in IQF form rather than in blocks. Further, exporters save the cost of the packaging material, used for blocks, which at present do not reach the consumer and are ultimately destroyed by repackers in USA. Besides, the extra freight of 25 per cent paid for the shell of the shrimp can be eliminated. These savings represent at least 30 cents per lb. more to the Indian processors and exporters. Based on the frozen shrimp export of 16,315 tonnes in 1968-69 and assuming that 50 per cent of this quantity would have been prepared in this manner, India would have realized an additional $ 3.4 million in terms of foreign exchange earnings.

Faulty Grading Practice. Indian exporters of frozen shrimp do the grading of the end-products on finished count basis, as against the international practice of grading the original raw shell-on basis. This practice causes the shrimps to become a grade smaller for sale purposes thus bringing the shippers the price of the next lower grade which is about 15 cents less per lb. A large proportion of Indian shrimp imported into USA is being thawed and repacked according to the international practice by the repackers who thereby gain 15 cents per lb. more.

Realization of Smaller Sizes. Unlike other suppliers to the US market, India and Pakistan export a large proportion of smaller varieties of shrimp. These varieties are generally used for production of convenience foods like soup and shrimp rolls. There is a good demand for smaller sizes upto 500 counts per lb. and India is one of the very few countries exporting this variety. But some of the Indian suppliers have been shipping consignments with counts sometimes upto 1,400 per lb. under the grade '131 up'. On account of this practice as also the variation in quality, the price realisation has been disadvantageous to India.

Packing and Packaging

Quality

a) Tinplate. Dependence of marine products industry on imported tinplate will have to continue till such time as requisite improvements are brought about in the quality of indigenous plate, particularly in respect of phosphorus and silicon contents, the safe limit for phosphorus in the base steel used for tinplate for Open Top Sanitary (OTS) cans being 0.020 per cent. Though the Rourkela steel plant is estimated to be currently producing about 48,000 tonnes, the quality of the plate has yet to be satisfactorily improved. It is also necessary to remove defects such as gauge variations, out-of-squareness, presence of greases on the surface and pin-holes.

b) Card Board. The quality of the indigenous duplex board used for making cartons needs to be improved particularly in respect of whiteness, calipre and scuff resistance.

c) Corrugated Paper Board. Most of the importing countries insist upon outer cases made of corrugated paper board having a minimum bursting strength of 200 lb. per sq. inch, and sometimes even a higher bursting strength, depending on the weight of the package and handling conditions. The quality of a 3-ply box made of imported kraft liner which is restricted to a substance of 180 gms. per sq. metre does not however give the 200 lb. bursting strength, with the result that 5-ply box is fabricated to achieve the necessary bursting strength, resulting in uneconomic costs. Thus the provision of import of kraft liner has become self-defeating in its purpose. The Survey Team, therefore, recommends that import of kraft liners of a substance of 225 gms per sq. metre and more should be facilitated.

d) Labels. Though the quality of Indian labels has imporved over the years, there is scope for further improvements in the quality of indigenous art paper so as to be amenable for higher quality printing. The present policy which permits import of labels, should be continued as most of the foreign buyers insist on the use of their own labels. It is rather anomalous, however, that while lablels are allowed to be imported, art paper is not permitted. It is recommended that the Government should allow the import of art paper and institute a proper organisational machinery to ensure that art paper imported under this scheme is used only for bonafide purposes, presumably on the lines of the present nomination scheme for the imported tinplate.

Sizes

Although the 301 x 206 shrimp can (with 5 oz prawn in brine) made in India is accepted in world markets, the most popular international size used for packing shrimp is 307 x 113 (with 4½ oz prawn in brine) which is not locally manufactured at present. The non-availability of 307 x 113 can leaves no choice to the exporter but to pack excess weight upto ½ oz to meet the requirements of the US Food and Drug Administration. As all the countries exporting to USA have the advantage of the right size of the can for packing 4½ oz, the Indian exporters continue to suffer from the disadvantage of packing excess weight without realizing any extra compensation in prices.

The three-piece rectangular can (402 x 207 x 102), with top soldered and bottom seamed, used by the Portuguese for exporting sardines has become popular in the international markets. Non-availability of this can from Indian fabricators has, according to some marine products exporters, so får proved to be a major hurdle. The overseas Survey has revealed that Norway has recently introduced an aluminium can with 'ring pull' ends, which is more amenable to easy opening and hence likely to capture consumer preference. If the fabricators do not consider it economical at present to invest on special equipment that might be required to undertake the manufacture of such cans, the Indian exporters might be allowed to import the cans from abroad to facilitate test marketing of the product.

Standards

In the absence of standards and enforcement thereof, there have been several overseas complaints about packing and packaging of seafood products. Keeping in view the requirements of major importing countries, standards should be laid down for packing and packaging material such as card board cartons, waxed cartons, cans and labels used by exporters and incorporated in the quality control and inspection measures in force in the country. The fabricators should be required to guarantee conformity of packages and materials supplied to such standards.

Shipping Facilities

The Survey has revealed that there is an urgent need for effective coordination between the shipping requirements of the industry and the shipping facilities available at different ports. Excepting in Cochin and Bombay ports, other ports like Ratnagiri, Goa, Mangalore and Madras are not adequately covered by sailings with reefer space. Here again, the available sailings at Cochin and Bombay do not coincide with the requirements of the trade. Adequate shipping facilities in Madras, Visakhapatnam and Paradeep have yet to be developed. Development of all-weather ports providing direct berthing facilities synchronising with the establishment of processing units and expansion of existing industrial activities in these regions to offer sufficient inducement of traffic to shipping lines is the only long term solution. During the interim period the shipping lines should be persuaded to offer sailings at these ports on a selective basis by offering sufficient cargo at least to serve as a minimum inducement.

Freight Rates. Majority of the shipping conference lines operating on different routes have not yet formulated specific tariff rates and frozen marine products are treated as refrigerated cargo NOE (Not Otherwise Enumerated) and are charged higher freight rates. Besides, freight rates have not been worked out on the basis of the principle of 'what the traffic can bear'. It is considered unfair to impose uniform rates on all items of marine products like shrimps, lobster tails and froglegs irrespective of their sizes and price realisation in export markets. For example, the smaller types of frozen shrimp known as, "titi" 250-500 counts fetch only one-third of the price realised by large size shrimp of 16-20 counts. It is, therefore, suggested that the Directorate General of Shipping should persuade the Shipping conferences to devise freight classification separately for small and large varieties of these items.

Export Assistance

The present Government policy allows the importation in large quantities of items like stainless steel and fishing hooks which are not required to that extent for shrimp fisheries and hence the Replenishment Export Policy (REP) is reportedly being misused especially when nomination of licences is not permitted and the imported items fetch high premium. It is, therefore, necessary that the REP scheme should be reviewed by the

Government. It is recommended that import of items like marine diesel engines, nylon, plate freezers and other processing equipment required for imporvement, diversification and expansion of industry should be permitted.

At present a few export firms have been exporting new marine products like filleted pomfrets and laminated Bombay duck with encouraging results in terms of market acceptance. These efforts at diversification of new items should be encouraged by providing the form of long term and/or short term loans for purchase of fishing equipment. Finances for the shrimp industry have, to a large extent, come from private operators and commercial banks. Even the commercial banks have been reluctant until very recently to advance funds for the acquisition of fishing vessels and other capital equipment or to provide adequate working capital.

With a view to undertaking the programme of rapid growth and development of Indian fisheries, large integrated projects involving deep sea fishing operations and exports of marine products in competitive world markets would require heavy investment for which necessary finance will have to be arranged from government and other financial institutions on easy terms and deferred payment arrangements. The rate of interest charged should not exceed 6 per cent per annum. The Government should also assume full responsibility to finance the construction and development of fishing harbours, landing facilities, slipways and other infrastructural facilities.

Tax Relief and Incentives

Besides the grant of loans and subsidies for fishing vessels and equipment the Government of India will be required to provide other relief measures and incentives to attract more investment in the fishing industry as has been done by countries like Mexico, Kuwait, Singapore, Malaysia and Indonesia. These countries grant relief in the rate of interest on loans for fishing industries, relief on income tax for foreign technicians and on fees for technical services, tax holiday for new industrial undertakings or expansion of the present establishments.

Other incentives offered by these maritime countries include (i) supply of duty free oil for fishing vessels, (ii) liberal import of fishing vessels, (iii) issue of guarantees on behalf of the fishing units to the foreign suppliers of machinery and equipment who are prepared to extend credit terms and are willing to accept payment in foreign exchange earned by the importing companies through the export of marine products, and (iv) exemption of import duties on plant, equipment and inventory requisites imported from abroad for new products. While the Survey has estimated and recommened subsidy on fishing vessels to the extent of Rs 190.76 million and relief to the tune of Rs 87.55 million for the supply of duty free oil to the fishing industry by 1978-79, exemption of import duties on equipment and machinery imported for developing new products by fishing industry also merits consideration.

Streamlining of Assistance

Unlike some of the developed countries like Norway and Iceland which have special fishery banks for financing solely the needs of their fishery industries, there are no such banks or institutions exclusively devoted to the financing of this industry in India. The Agricultural Refinance Corporation (ARC) of the Reserve Bank of India, the Industrial Development Bank of India (IDBI), Industrial Finance Corporation and some of the commercial banks have recently come forward to advance loans to the fishing industry. However, the nature of financial assistance and terms and conditions have still to be streamlined and improved to meet the special requirements of the fishing industry for the supply of fishing vessels, processing plants and other equipment on deferred payment basis.

RESEARCH AND DEVELOPMENT

Research

The Survey emphasises the urgent need to bring about coordination among the various research institutions and organisations connected with fisheries developments with a view to achieving effective results and avoiding duplication of research efforts by clearly demarcating the areas of their activities. The Survey, therefore, recommends that:

i) The Deep Sea Fishing Organisation, the Central Institute of Fisheries Technology, and the Indo-Norwegian Project in collaboration with the State Departments of Fisheries should undertake systematic research on the types of gear for shrimp and ground fish from vessels of different sizes and in different areas, electronic aids, and operation of night trawls in known grounds.

ii) The Central Marine Fisheries Research Institute, Deep Sea Fishing Organisation, and Indo-Norwegian Project, in collaboration with the State Departments of Fisheries should undertake research on pelagic fisheries like sardines and mackerels on the west and the east coasts for location of grounds and suitable gear.

iii) Investigations for demersal fish and shrimp beyond 40 fathoms should be organised by Deep Sea Fishing Organisation, Indo-Norwegian Project, Central Institute of Fisheries Technology and Central Marine Fisheries Research Institute.

iv) The Indo-Norwegian Project, Deep Sea Fishing Organisation and Central Institute of Fisheries Technology should undertake research on purse-seining from 36 and 45 footer vessels for sardine and mackerel fisheries on the west coast upto Ratnagiri and in the north.

v) The Central Marine Fisheries Research Institute and the Indo-Norwegian Project should initiate research on the declining sizes of shrimp landed in the Kerala coast and the effect of reclamation of back waters and the closure of openings of the back waters and brackish water lakes from the sea with a view to preventing any possible ill-effects on the breeding of shrimp.

vi) The Central Food Technological Research Institute and the Processing Wing of the Central Institute of Fisheries Technology in association with the Marine Products Processing Training Centre should undertake research on processing of IQF, improved methods of handling and preparation of items like breaded shrimp, prawn paste and fish flakes.

vii) The Indian Institute of Packaging and the Central Food Technological Research Institute should collaborate for research on problems of packaging.

Although quite a lot of useful work has been done independently by different research organisations like Central Marine Fisheries Research Institute (CMFRI), Deep Sea Fishing Organisation, Central Institute of Fisheries Technology (CIFT), Central Food Technological Research Institute (CFTRI), Central Inland Fisheries Research Institute, Indo-Norwegian Project, Marine Products Processing Training Centre, State Directorates and Departments of Fisheries on various aspects including marine biology, charting of fishing grounds, exploration of new fishing areas, development of new products and suitable craft and gear, there has been some overlapping in their activities and the results of their research have not been fully disseminated to the trade and industry.

Besides, the results of the various researches undertaken by these institutions, although of much scientific value, have not directly contibuted to meet the needs of the marine products industry except in selected regions on limited problems like small shrimp trawl, bacteriological controls, and certain improvements in the seafood products. It is important that the research should be directed to solve both immediate and the long range problems of the fishing industry, specially those connected with the export of fishery products. In areas where such programmes have already been undertaken, it is necessary to apply them to wider areas to solve the local problems faced by the industry in other areas. It will also be necessary to try these results on pilot basis and conduct field trials in actual industrial conditions. The industry should also be made to actively participate both at the planning and the execution stages of the research programmes.

It will be equally important that any regulation on the quality of the product or standardisation of the plant and equipment should be preceded by bringing to the notice of the industry the existing situations, defects and the methods to improve these situations. The Export Inspection Agency and research institutions should also work in close liaison with the industry.

Training

Coordinated effort is also required by training institutions like Central Institute of Fisheries Operatives, Central Institute of Fisheries Education, Central Inland Fisheries Research Institute, Regional Training Institutes and various training centres for immediately assessing the needs of technical personnel like skippers, fishing second hands, engine drivers (deep sea), radio telephone operators, processing technicians, master foremen etc. during the Fourth and Fifth Plan periods. They should also orient their training programmes to meet the demand emanating from public and private sectors of the industry for such personnel in the immediate future.

In the long run, however, it will be necessary for the various fishery training institutions in India to develop a comprehensive system of fishery education on the pattern prevailing in Japan, especially in view of the expanding needs and growing importance of the subject of fisheries administration & management as also fishing, fish processing, fish marketing etc. Japan is the only country in the world which has a comprehensive system of fisheries education in its 78 senior high schools and colleges and 14 universities, each one engaged in imparting education and practical training in fishing operations, fish processing, fisheries management, marine engineering, radio & electronics and general fisheries.

ORGANISATIONAL SET-UP

Under the existing organisational set-up for the development of the fisheries industry there is no organisation which is directly responsible to look after all the aspects of the industry relating to production, processing and export marketing. The various existing organisations in their respective fields are engaged in exploration, research, training and export promotion activities. For instance, the Deep Sea Fishing Organisation, the Indo-Norwegian Project, and the Central Marine Fisheries Research Institute undertake exploratory fishing to help the industry in increasing production by charting new fishing grounds; the Central Institute of Fisheries Technology, Central Food Technological Research Institute and the Marine Products Processing Training Centre and numbeous research laboratories of the State Departments of Fisheries are engaged in carrying out research in the field of processing; the Central Institute of Fisheries Operatives and the Central Institute of Fisheries Education cater to the requirements of trained personnel; and the Marine Products Export Promotion Council and the Seafood Exporters' Association are looking after the problems relating to export promotion of seafoods. These organisations are neither fully equipped for the task nor is there proper coordination among them.

Mexico, Brazil, Nicaragua, Japan, Norway, USA, Peru, Portugal and Italy are some of the many countries in the world which have introduced regulatory measures for developing their fishery industries. On account of this the development in these countries has been on an organised and progressive manner. They have been able to maintain the level of their production and exports. In India it is necessary to subject the industry to some sort of discipline and control with a view to bringing about proper growth and even development of the fishery industry. The results achieved by the successful functioning of the various centralised agencies in other maritime countries like the White Fish Authority and the Herring Industry Board in UK, the Commodity Board for Fish and Fishery Products in Netherlands, the Norwegian Fishermen Sales Organisation in Norway and the Fish Marketing Organisations in Thailand and Hong Kong which have been responsible for developing their fisheries highlight the need and efficacy of institutional development to organise, develop and regulate the fishery industry in India on similar lines.

Shrimp Export Development Authority

Shrimp Industry having attained a unique place from the view-point of exports, the Survey Team recommends that, to begin with, it is necessary to immediately bring this industry under a unified and centralised control of a statutory agency on the lines of similar organisations in other maritime countries. It also recommends the establishment of another centralised agency for other fisheries like tuna, sardine, mackerel and other fish as and when they reach a certain level of development and importance as attained by the shrimp fishery. Such an organisation for shrimp fishery may be called "The Shrimp Export Development Authority" and should also include within its purview other potential items like lobster tails, crabs, froglegs and other products in the beginning.

The shrimp fishery has considerable export potential. According to the Survey Team, exports of shrimp can be increased from Rs 212 million in 1968-69 to Rs 515 million by 1973-74 and Rs 827 million by 1978-79. Realisation of these export targets would require the development of this fishery at a much faster pace, which requires the appropriate measures to overcome the following bottlenecks existing in various segments of the industry:

1) There is a heavy concentration of processing facilities, particularly, in the Kerala State, whereas east coast and the north-west coast of the country do not have necessary processing capacities despite the availability of raw materials;

2) The growth of merchant-exporters has created competition to established exporters by overbidding the raw material prices at home and being indifferent to the realisation of remunerative prices abroad;

3) The traditional block processing of shrimp by Indian processors requires a changeover to Individual Quick Frozen processing in view of the overseas consumers preferences and high unit value realisation; and

4) There is an urgent need for broadening and strengthening the present inspection system backed by necessary research and technical know-how.

In order to enable the proposed Authority to undertake measures in solving these problems, it would need to be vested with the following functions:

a) To undertake registration and licensing of fishing craft, gear, peeling sheds, processing plants and exporters;

b) To assess the requirements of fishing harbours and to ensure the provision of landing centres, cold storages, transport and other ancillary facilities;

c) To augment raw material availability by encouraging exploitation of off-shore and deep-sea shrimp resources;

d) To regulate and limit the processing capacity in accordance with the availability of raw materials and to encourage diversification of the processing facilities;

e) To devise marketing strategy as required by the overseas markets and to encourage group marketing under limited brand names;

f) To prescribe and enforce norms and standards for in-plant inspection for shrimp fishing vessels, peeling sheds, processing plants and export shipments;

g) To undertake research and experiments either independently or in collaboration with other research agencies and for that purpose to provide, acquire, equip and operate vessels or processing plants in any region on the Indian coast;

h) To assess and indicate from time to time the manpower requirements of the fishing and processing sectors of the industry and to suggest programmes for their training requirements to the concerned institutions.

i) To arrange financial assistance by way of loans to the shrimp fishing and processing units.

Considering the nature of the functions spelt out above, it is necessary that the Authority is vested with statutory powers. However, certain difficulties are currently apprehended in the establishment of the Authority on account of the varying nature of the constitutional status of the subjects to be covered. For example, fishing beyond territorial waters, export of fish and fish products, control of prices and quality control come under the jurisdiction of the Central Government while fisheries upto the territorial waters and 'industry' as a whole fall under the State List. Therefore, it may be necessary that steps are taken to declare fishing and fishery industry as an industry of public importance so as to introduce a compact legislation relating to the Shrimp Export Development Authority.

EXPORT PROSPECTS

Against the background developed earlier, export prospects for various marine products in international markets are discussed below.

USA

Shrimp. USA is the principal and the most attractive market for Indian frozen shrimp. Despite competition from meat and poultry products and a static level of per capita fish consumption at 11 lbs, the per capita shrimp consumption, of late, has been showing an upward trend in US from 1.04 lbs in 1961 to 1.41 lbs in 1968, thereby showing an increase of 35 per cent. It has been estimated that in the next decade and half this growth rate will be maintained in the US market. This has been corroborated by the rising imports of shrimp during recent years from 238 million pounds in 1961 to 389 million pounds in 1968.

The principal shrimp exporting countries to the US market are as many as 60. Of these, Mexico, India, Panama, Guyana, French Guiana, Ecuador, Venezuela and Pakistan are the main sources of supply. Indian shrimp thus faces stiff competition from the Mexican, Panaman and Pakistani shrimp.

Yet another growing shrimp exporting country from Asia is Thailand which is expected to offer competition to the Indian product.

Based on the import data for 1968, it would be seen that India figures as one of the principal sources of frozen shrimp in various forms next only to Mexico. But its unit value realisation has been far less compared to other suppliers. Whereas Mexico netted $ 1.01 per pound for peeled frozen shrimp and Nicaragua $ 1.01, India's realisation per pound was of the order of $ 0.47. This is far below the average realisation of $ 0.79 per lb. of aggregate shrimp imports from all sources in USA. Japan and Chile are the principal competitors for peeled and cooked shrimp in this market, realising higher export earnings of $ 0.37 per pound. The relatively lower earnings of Indian shrimp have been largely ascribed to traditional method of processing in block form, instead of IQF and 'ready to cook' items, practice of grading end products on finished count basis, and larger proportion of smaller sizes.

USA is also a principal market for Indian canned shrimp. Here again, the price realisation for the Indian product compared to Japan is less by 20 cents, and also does not compare favourably with the average price realisation.

Although shrimps and prawns (shell-on) are imported by the US in substantial quantities from Mexico, Panama, Kuwait, Guyana, Indian exporters have not made much headway so far in this product.

Lobster tails. Lobster tails are imported by USA in large quantities. The major suppliers to this market are South Africa, Australia, New Zealand, Brazil, India and Thailand. Whereas the average unit value is $ 2.02 per pound, Indian realisation is of the order of $ 1.24 per pound. Australia is fetching higher unit value at $ 2.46 per pound while South Africa, the major exporter, nets $ 1.89 per pound. The price differential is mainly due to the quality of the rock lobsters exported by Indian exporters. Canada figures as the major supplier of live lobsters to the US market. The US also offers possibilities for lobsters in air tight containers and a beginning in this direction has been made by the Indian industry in 1969.

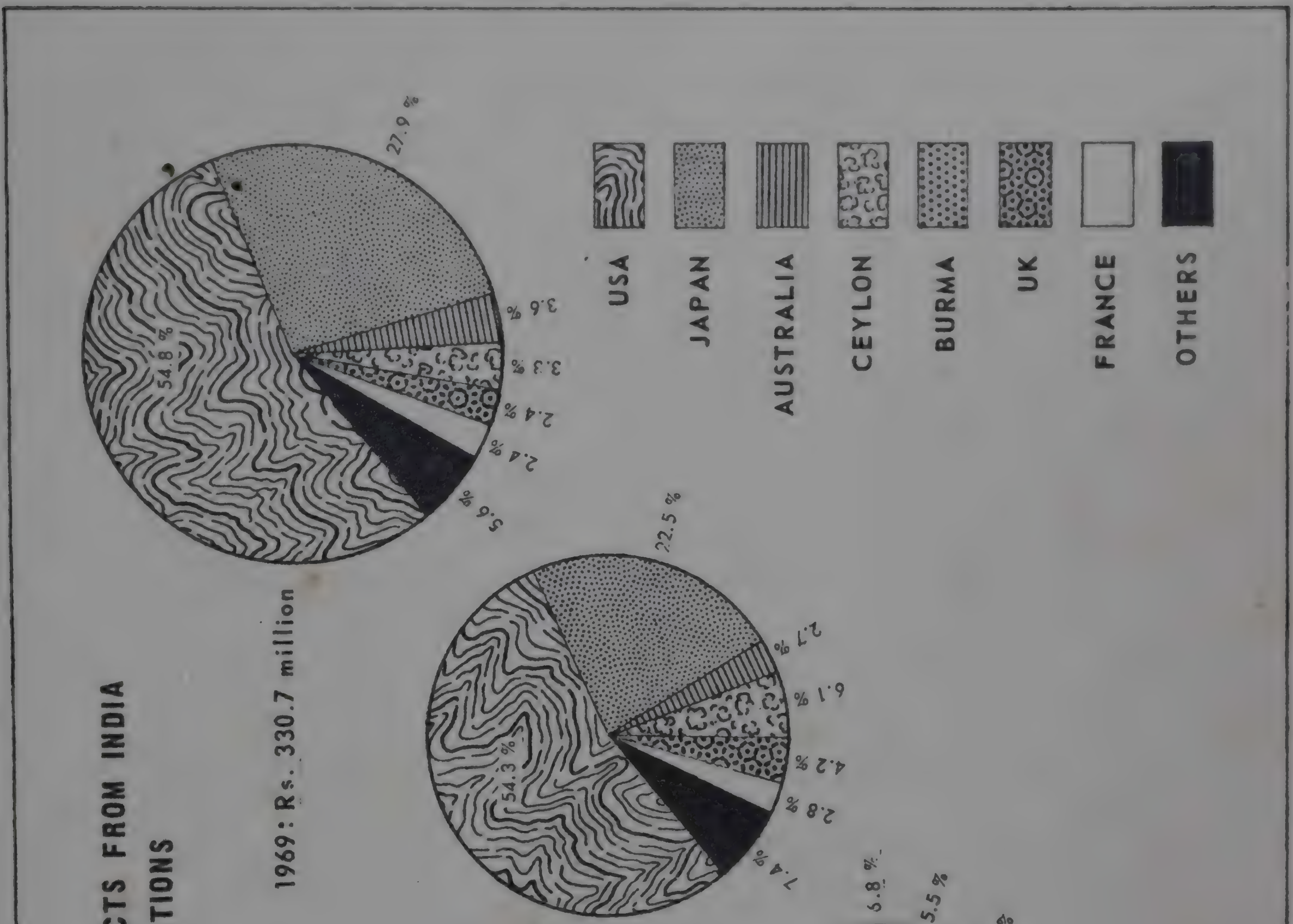
Froglegs. With sustained effort and strict bacteriological tests, India can step up exports of frozen froglegs to this market, despite competition from Japan, Mexico and Pakistan. Although India realises comparably higher unit value at $ 0.57 per lb. than Pakistan ($ 0.53 per lb), it stands far behind Mexico and Japan, which net higher unit values at $ 0.72 and $ 0.71 per lb respectively.

Tuna. The growing American market offers export possibilities for tuna in frozen form. Nevertheless, it should be borne in mind that the prices quoted by Indian exporters should not exceed those of competitors like Japan and Spain.

Sardines. India will be able to step up sardine landings considerably in the years to come. Canned sardines are imported by USA at present from South Africa, Morocco and Norway. The unit values range from $ 0.15 per pound in the case of South Africa, $ 0.50 for Morocco and $ 0.32 for Norway. Indian sardines can make dent only if the product is offered at competitive prices.

Other items which can make inroads into the American market are:

(a) Shrimp in I.Q.F.
(b) Breaded shrimp
(c) Fish sausages
(d) Fish pastes and flakes
(e) Fishmeal and other by-products



EXPORTS OF MARINE PRODUCTS FROM INDIA BY MAJOR DESTINATIONS

Chart - 2

Japan

Although Japan is the leading exporter of fishery commodities of the world, it does import certain special items such as canned tuna, frozen shrimp (shell on) and salmons.

Taking advantage of the growing internal demand of selected varieties of fishery commodities, Indian shipments of frozen and canned shrimps and other fish have increased substantially during the recent years sharing 25 per cent of the total marine product exports from India. Apart from frozen shrimp and dried shrimp, crab meat and sardines are the other ~~items~~ which find ready acceptance in the Japanese market.

Mexico is the principal supplier of frozen shrimp, followed by Hong Kong, Thailand, India, China (Mainland) and Pakistan. It will be interesting to note that while Hong Kong and Mexico realise higher unit values in this market, India's realisation is far below the average unit value of the product. Similarly, Pakistan's earnings also showed slightly higher than the unit value realised by Indian product. It has been estimated that in keeping pace with the growing consumer preference for shell-on shrimp and frozen lobsters, the Japanese market will continue to be the major outlet for Indian product next only to USA in the coming decade. However, care has to be taken to see that the quality is maintained and the prices are competitive compared to other countries such as, Mexico, Thailand, Pakistan and China (Mainland). The Survey highlights that the Japanese market provides ample opportunities for promoting export of frozen tuna, Indian salmon in frozen form, sardines in air tight containers, crab meat, canned and live eel.

The bulk of the frozen tuna shipments come from China (Mainland), South Korea, Malaysia and New Herbrides. USA is the principal supplier of frozen salmon to this market followed by USSR and to a small extent China (Mainland). In view of the anticipated landings of Indian salmon because of the deep sea operations, the Indian exporters can also exploit this market for this item.

In the next decade, sardines in air tight containers are likely to contribute substantially to Indian exports of marine products. At present South Africa, Norway and Portugal are the principal sources of supply. Efforts should be directed to supply sardines in suitable cans of consumer acceptance.

Although small quantities of crab meat are imported at present mostly from South Korea, Japanese market provides ample scope for the processed crab meat from Chilka Lake (Orissa). Also efforts can be directed to introduce the 'convenience' foods in the Japanese market for some of the table fish such as filleted pomfrets and Bombay duck, fish sausages, fish pastes etc.

United Kingdom

Although UK ranks next only to USA in the order of world imports of fishery commodities, India's share in the UK market has so far been negligible. The market provides ample opportunities for the development of frozen and fresh crustaceans and tuna and frozen fish on a large scale. At present Norway, South Korea, Hong Kong, Australia and China (Mainland) constitute the major provenances of the fresh and frozen shrimp to the UK market. Small quantities of fresh prawns are procured from Norway. Portugal constitutes almost the sole source for canned sardines to this market. Substantial quantities of tuna are also imported from Japan and Peru. At present Canada is the only supplier of canned lobsters to the UK market. In view of the growing demand for these products in the markets, efforts should be directed to step up and introduce the above mentioned products in this market.

Apart from shrimp, lobsters and tuna the UK market is a principal source for Indian dried fish, notably Bombay duck. In fact the earnings of laminated Bombay duck will be more than trebled if processed suitably in mechanical drying units. Efforts should also be made to introduce fish by-products and preparations into this market.

Australia

Despite the growing fishing industry in Australia, it is one of the important markets for Indian frozen shrimp in the cooked form. In fact, Australia has been sharing, three per cent of India's total exports during the recent years. China (Mainland) is the leading supplier of frozen shrimp to this market followed by Hong Kong, India and Thailand. Whereas Hong Kong realises unit value of $ 0.87 per pound, India and Thailand obtain a unit value of $ 0.73 and $ 0.65 per pound respectively in this market. India's unit value realisation is lower mainly due to defective packing and grading.

France

France has been a major market for Indian froglegs in frozen form, since the beginning of the sixties. It also takes substantial quantities of canned shrimp from India. At present the bulk of shrimp shipments come from Senegal, Algeria and Tunisia. Lobster tail requirements of the French market are met from Cuba, South Africa and Ireland. Crabs of certain special varieties can be marketed at a price ranging between $ 10 to $ 12 per kg. If Indian Chilka crab can conform to the specifications, efforts can be made to capture a part of the market. Nevertheless India will have to face stiff competition from Turkey and Italy for the export of crab and lobsters in this market. Japan, South Africa and Mauritania are the major suppliers of tuna at present.

West Germany

It has been reported that West Germany would continue to maintain her place as one of the principal importers of fish in fresh and canned forms. Japan, Portugal, Morocco and USSR are at present the principal suppliers of canned fish to this market. With necessary promotional efforts it should not be difficult for Indian exporters to capture the market for canned shrimp, sardines, tuna, eel and frozen shrimp, lobster tails and froglegs.

In addition to the sophisticated markets of North America, Europe and Far East, possibilities exist for stepping up India's exports considerably to Ceylon, Hong Kong, Singapore for dried prawns, dried fish, sharkfins and fishmaws. Markets which provide potential but need to be tapped are Kenya, Uganda, Tanzania, Nigeria and some of the Middle East countries for these products.

South East Asia and Africa

Ceylon, Hong Kong, Singapore and Mauritius are some of the major markets for Indian dried seafoods. Ceylon takes the bulk of dried fish exports, while dried prawns, sharkfins and fishmaws are shipped mostly to Singapore, Hong Kong and Malaysia. Although dried seafood industry is an old and traditional one, the increasing preference for frozen goods notwithstanding, the neighbouring countries will continue to rely on Indian dried fish in the years to come because of the preference for these varieties of fish. Nevertheless much increase in exports is not anticipated in these markets. Promising markets are located in Africa and Middle East, most important being Kenya, Uganda, Tanzania, Nigeria, Senegal etc. However, with a view to capturing these markets a great deal of promotional efforts are needed.

In brief, the volume and value of exports to major markets during the Fourth and Fifth Plan periods are indicated in table A-7. The detailed item-wise and marketwise export projections are given in Annexure A2.

Table A-7

Export Projections of Marine Products by Major Markets

Qty: Tonnes
Val: Rs million

Market	1973-74 Qty	1973-74 Val	1978-79 Qty	1978-79 Val
USA	22,814	321.91	36,384	480.91
Japan	10,317	147.46	23,300	258.60
UK	2,914	32.58	15,185	85.78
W. Germany	1,317	12.61	11,498	47.84
France	1,692	20.83	5,190	38.68
Ceylon	4,230	11.63	6,881	25.80
Canada	792	10.39	1,770	23.40
Australia	684	10.00	1,000	15.00
Hong Kong	825	6.05	1,284	9.52
Others	4,465	35.97	47,508	194.47
Total	50,050	609.43	150,000	1,180.00

The steep rise in exports from Rs 35.97 million in 1973-74 to Rs 194.47 million in 1978-79, as projected by the Survey Team in the case of 'other' markets in Table A-7 is on account of the anticipated high production and promising scope for frozen and canned fishery products, currently moving in very small quantities.

The next section is devoted to commodity-wise analysis and export projections by 1973-74 and 1978-79.

COMMODITY REVIEW

Shrimp

Shrimp is the most important item in international trade among all the marine products, although its average world catch constitutes only about one per cent of the total world fish landings. In 1968 the world trade of this commodity was 74,200 tonnes valued at $ 143 million.

Shrimp is broadly classified into penaeid and non-penaeid prawns, the former being larger in size yields higher unit value. The species of shrimp and prawns identified all over the world run into hundreds but those of commercial significance are only ten in number, of which five commercially important ones occurring along the Indian coast are metapenaeus dobsoni, metapenaeus affinis, parapanaeopsis stylifera, penaeus indicus and penaeus carinatus, known by local names as Poovalan, Kazhanthan, Karikkadi, Naran and Kara Chemmeen respectively.

Shrimp catch in India is mainly effected through small mechanised boats having a limited range of operation in the inshore waters. To a small extent it is also caught in drag nets, traps and stake nets in backwaters and lagoons. As against the general practice of small boats for catching shrimp in India, the trend in other maritime countries of the world such as USA, Mexico, Japan and Thailand is mainly towards the use of modern large steel vessels equipped with electronic equipment which are highly economical in operation. The modern technological developments in craft and gear employed in other countries have yet to be applied in India. Night fishing for shrimp, which is a recent development in the other leading shrimp producing countries of the world, has not been attempted in India, so far.

The catch of various species of prawns varies from region to region and season to season on the Indian coast. The landings of penaeid prawns in India vary between 12.7 per cent and 35.8 per cent depending on the season, while those of non-penaeid prawns range from 3.4 per cent to 44.5 per cent. The highest proportion of catch of penaeid prawns is effected during July-September while that of non-penaeid prawns during April-June.

The large size shrimp is fished from the South and North East Atlantic, Gulf of Mexico, the Caribbean Sea, Persian Gulf, Arabian Sea, Bay of Bengal, Australian coastline and the coast of Africa.

Landings

United States, India, Thailand, Mexico, Japan and Malaysia are the leading producers of shrimp and together account for about 70 per cent of the total world catch. Next only to USA, which contributes about 19.0 per cent of the world landings of shrimp, India occupies the second place with 14.3 per cent share. World landings of shrimp have risen from 490,000 tonnes in 1961 to 771,000 tonnes in 1968, or at an average annual growth rate of 6.7 per cent. Shrimp production in India has simultaneously increased from 62,800 tonnes to 99,800 tonnes during the same period or at an average annual growth rate of 6.8 per cent.

Whereas there has been in general a steady increase in the shrimp landings of USA and India during 1961-68, the increased production has been punctuated by occasional decline during the intervening years on account of the seasonal nature of this fishery. An important feature relating to the shrimp production of Japan and Mexico is that these two countries have experienced steady decline in catches. Shrimp production of Japan has declined from 73,500 tonnes in 1961 to 66,300 tonnes in 1968 recording

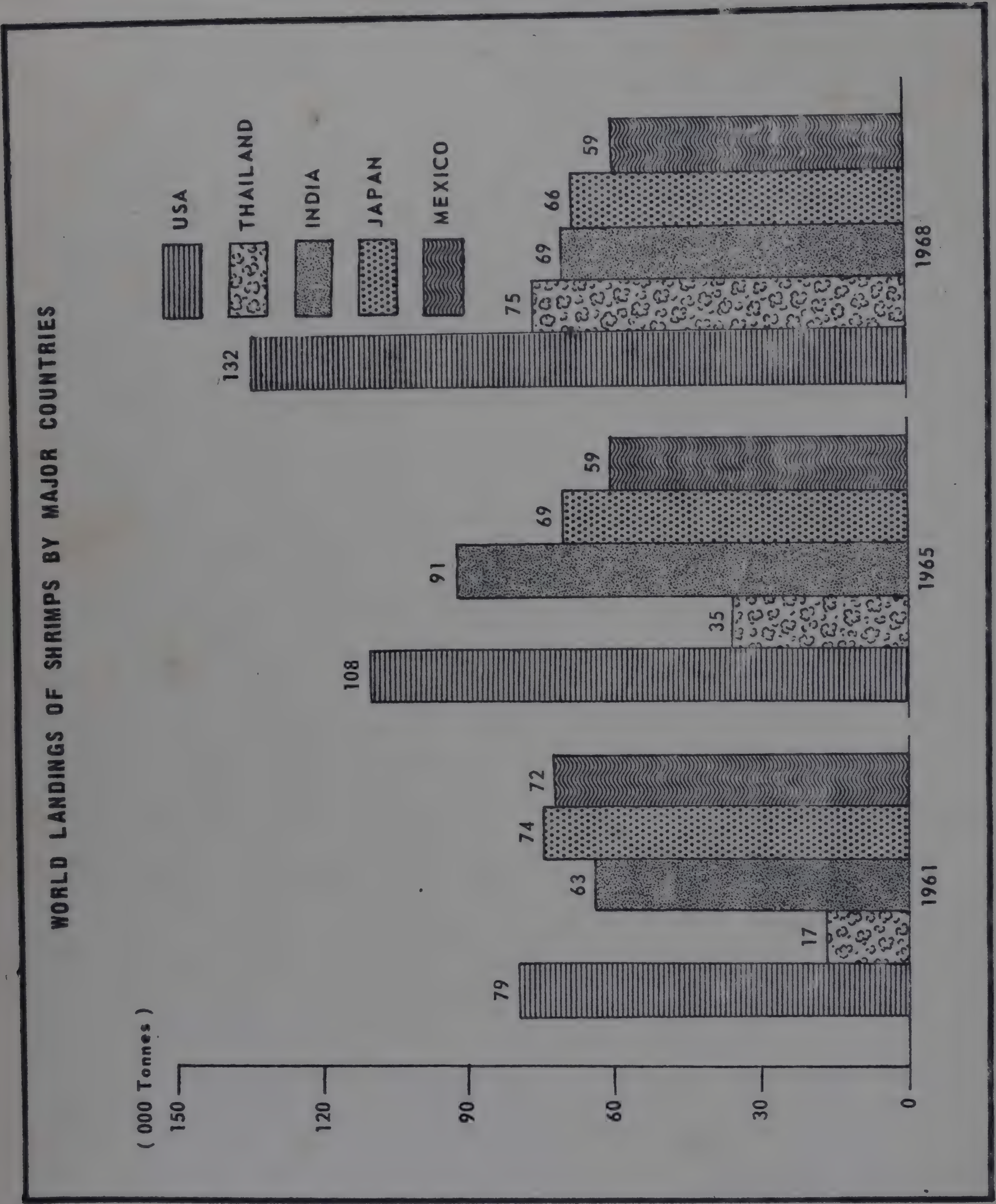

WORLD LANDINGS OF SHRIMPS BY MAJOR COUNTRIES

Chart - 3

a fall of 23 per cent. During the same period Mexican catch has gone down from 72,300 tonnes to 58,600 tonnes recording a fall of 18 per cent. On the other hand, Thailand and Malaysia have made tremendous progress in the exploitation of their shrimp resources. Thailand having increased its landings by seven-fold from 10,500 tonnes in 1961 to 75,000 tonnes in 1968 has occupied the third place with 10.7 per cent contribution to the total world landings of shrimp. Malaysia has doubled its production during the same period and its production at 32,900 tonnes in 1968 accounted for 4.7 per cent share in the world production.

Landings in Maritime States

Kerala, Maharashtra, Tamil Nadu, Andhra Pradesh and Orissa are the principal prawn producing States in India. Penaeid prawns account for about 70 per cent of the total shrimp landings in the country although their distribution in the States is extremely uneven. Kerala accounted for about 40 per cent of the annual penaeid prawn production, Maharashtra and West Bengal (including Orissa) each account for 16 per cent ; Andhra Pradesh and Gujarat 8 per cent and 4 per cent respectively. Maharashtra accounts for about

42 per cent of the total landings of penaeid and non-penaeid prawns but the latter category being more predominant these are used for drying. The trend of landings of this fishery is on the increase, its production having more than doubled in Kerala during the last few years. Other States such as Andhra Pradesh, West Bengal & Orissa have also increased their production. Exploratory surveys and investigations have indicated the availability of quality shrimp in good quantities off Saurashtra, Ratnagiri, Mangalore, Kerala, Gulf of Manaar, Coromandel Coast and West of the Bay of Bengal.

Decline in the Mean Size of Prawns. There is a feeling in the fishing industry in Kerala that there has been a decline in the size of prawns. The data collected by the Central Marine Fisheries Research Institute for the last four years have provided evidence to prove this fact. According to their investigations, the mean size of penaeus indicus and metapenaeus monoceros species of prawns has come down from 157.5 mm and 118.2 mm in 1964-65 to 130.4 mm and 92.5 mm respectively in 1967-68. The discussions held with various exporters during the survey revealed that although the situation was not alarming, the decline in the mean size was due to (a) expansion of fishing activity in the inshore waters of the west coast, particularly in the fishing grounds off. Cochin and Quilon and (b) shifting of fishing grounds from 21 m depth to 17 m depth. In order to check the declining trend in the size, it will be necessary to initiate the following measures:

1) The number of fishing vessels in the inshore waters, where the fishing activity has increased beyond the desired level will have to be restricted.

2) Mechanised vessels capable of fishing in offshore waters will have to be encouraged to undertake fishing beyond 20 metres depth.

3) Regulation should be prescribed to enforce the spawning period as a 'close season' for prawn fishing as is done in Mexico and Kuwait.

4) Investigations should be undertaken to study the effect of reclamation of brackish waters in India and measures adopted to prevent any further damage to prawn fishery.

Shrimp Processing

The shrimp processing industry in India comprises 48 freezing units and 42 canning units with annual rated capacity of 59,000 tonnes and 11,442 tonnes respectively. The industry is centralised in Kerala on the west coast with with concentration of 83 per cent and 85 per cent of the total annual freezing and canning capacity respectively in the country.

The processing units in the industry depend on (i) their own boats, (ii) purchases from landing centres and (iii) peeling sheds, for raw material supplies. While large varieties of shrimp are generally frozen, the smaller ones are used for canning. The dressed material is graded for freezing in contact plate freezers in the form of headless, (HL) fresh frozen, peeled & deveined (P&D) fresh frozen, and cooked peeled (CP) & cooked, peeled & deveined (CPD) frozen.

The classification for frozen shrimp is done into various grades running into a large number. The grades for the headless shrimp vary between 'under 10' per lb. to '61-70' per lb. and for peeled & deveined the variation is between 'under 15' and '130 up'. The grade '130-up' has recently been further divided into '130-250', '250-500' and '500-up'.

The canned shrimp is classified into 'supreme jumbo', 'jumbo', 'large', 'medium', 'small', 'tiny', 'cocktail/mini/salad', the number of counts per 100 gr. varying from 'upto 8' to '103 and above'. Four sizes of cans used for shrimp canning in India are 301x309 (one lb. jam cans), 301x206 (8 oz. fluid cans), 301x109 (5 oz. fluid cans) and 401x411 (A 2½ oz. cans), the popular one being

301x206. The internationally accepted size of can for export market is 307x113 which needs to be adopted by the Indian canneries.

In India grading is done by hand which is time-consuming besides being quite non-uniform and incorrect. In other countries this process is done mechanically which has the advantage of being accurate and more hygienic. The automatic grading machines can be introduced with advantage in the shrimp pocessing industry in India.

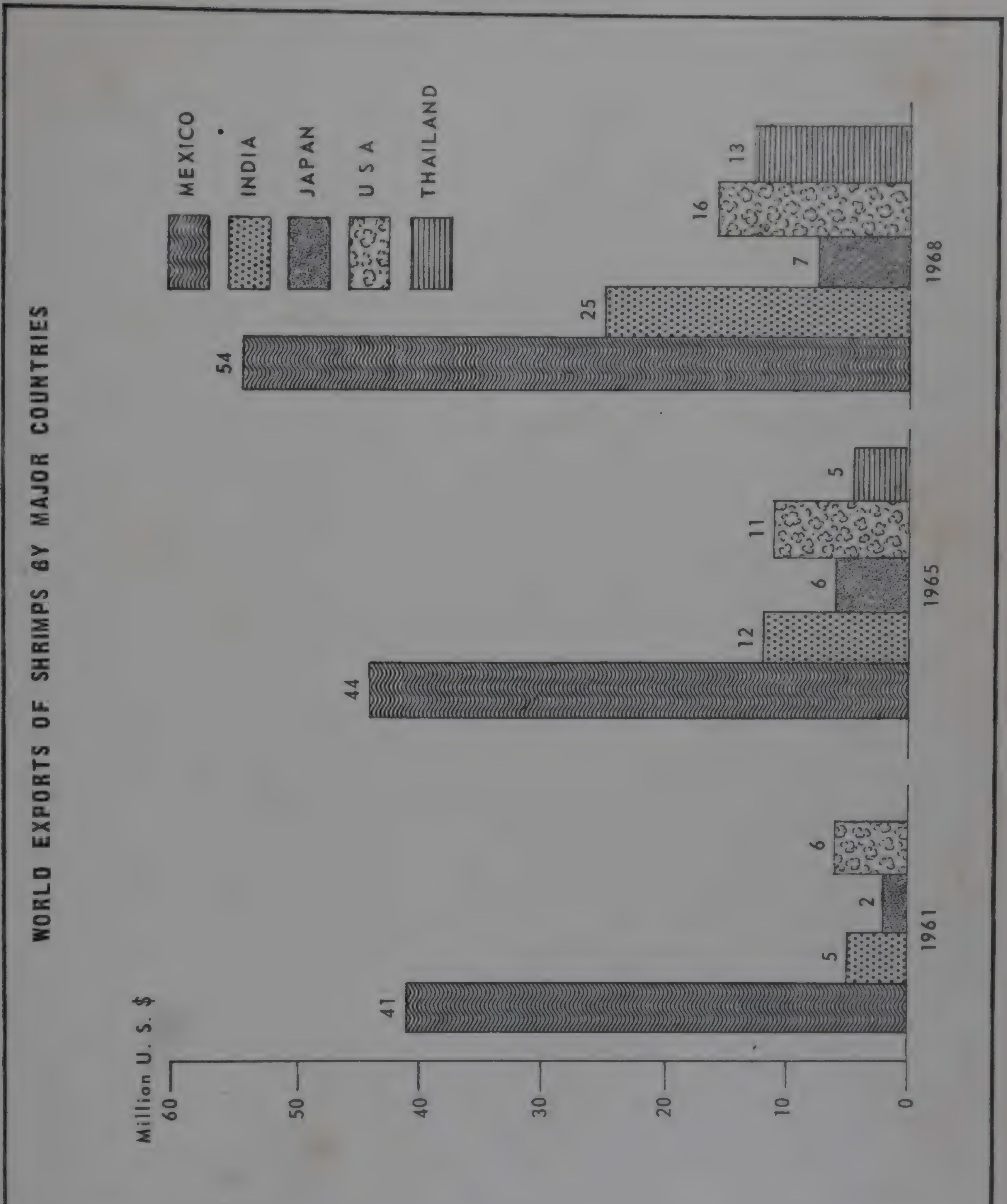
Diversification

Of the total frozen shrimp production in India, headless constitutes about 30 per cent, peeled and deveined in smaller sizes (11 to 130 and 130-up) forms about 55 per cent, and IQF only 1 per cent. In view of the increasing demand of IQF in the international market and the better unit value realisation compared to similar counts of frozen prawns in block form, there is need for the Indian shrimp industry to diversify its production with progressive shift towards IQF varieties.

About 50 per cent of the total weight of prawns and shrimp used for freezing and canning goes as waste in the form of heads and shells. Only a negligible quantity of this waste is at present utilised in the preparation of manure and the rest is all thrown into the back waters. This waste which contains high proportion of protein and oil can be used for preparing poultry feed for internal and external markets. The waste can also be utilised for preparing fishmeal. To begin with a fish meal plant can be established at a place like Cochin where shrimp industry is concentrated. Shrimp extract, breaded shrimp and prawn paste are some of the other items which can be considered for diversifying production in India.

Exports

The world trade of shrimp takes place in frozen, canned and dried forms. The total world trade of shrimp amounted to 74,200 tonnes in 1968 representing an increase of 37.4 per cent over 1961. Mexico, India, USA, Japan and Hong Kong are the principal shrimp exporting countries. Next only to Mexico which contributed 43.6 per cent share in the world trade, India ranks as the second major exporting country with 20 per cent share. Corresponding to the increase of world exports of shrimp by 37.4 per cent during 1963-68, exports of this item from India experienced a rise of 261 per cent.



WORLD EXPORTS OF SHRIMPS BY MAJOR COUNTRIES

Chart – 4

Direction of Exports

The principal markets for frozen prawns and shrimp are USA, Japan, Australia and the EEC countries. Prawns and shrimps in air tight containers are imported in bulk by USA, UK, EEC countries, Scandinavian countries and the Far Eastern countries. Exports of dried prawns and shrimp are mostly confined to Far East and Near Eastern countries principal among them being Hong Kong, Ceylon and Singapore.

Exports of frozen shrimp from India have risen from 4,671 tonnes (valued at Rs 15 million) in 1960 to 21,441 tonnes (valued at Rs 262.9 million) in 1969 or at an average annual growth rate of 24.4 per cent. In terms of value the contribution of frozen shrimp has risen from 37 per cent of the total marine products exports in 1960 to 80 per cent in 1969.

Export of shrimp and prawns in canned form also fared well in the overseas markets during 1960-68. From a meagre 320 tonnes worth of canned shrimp valued at Rs 2 million in 1960 India's exports of this item have risen to over 1,661 tonnes valued at Rs 22.1 million in 1969, contributing 6.6 per cent to the total marine products exports in 1969.

The dried fish industry has been showing a declining trend in the export performance although the decline is not very substantial. In 1962 India exported 3068 tonnes of dried shrimp to the tune of Rs 9 million. The exports have come down to 835 tonnes valued at Rs 4.8 million in 1969. The contribution of this item to the total marine export is only 1.5 per cent.

Price Realisation

The average price realisation per pound of peeled and deveined frozen shrimp from India in the principal market namely USA has shown an increase of about 13 to 30 cents for size grades ranging between '16-20' and '36-40' during 1966-68 whereas the price of smaller grades has shown a downward trend during this period the price decline being of the order of 16 to 18 cents per pound less for size grades 91-110, 11-130 and 130-up. More than 50 per cent of the total shrimp exports from India being of smaller varieties belonging to the grades 91-110, 111-130 and 130-up, the downward trend of prices of smaller varieties has affected the unit value realisation. The prices of headless frozen shrimp have recorded an upward trend upto the size grade 26-30 while the smaller grades have shown a slight fall ranging from 4 to 9 cents per pound. Although the similar trend has been noticed in the prices realised by other exporting countries to the US market the unit value realised by Indian shrimp exporters has been comparatively much less than that realised by its competitors. This lower unit value realisation is ascribed to various reasons important ones being (i) absence of IQF and 'ready to cook' items, (2) faulty grading and (3) unattractive packaging.

Canned shrimp from India also has been realising comparatively lesser unit value in all the markets. However, Canada where Indian canned shrimp has yet to establish a regular export market offers a slightly better price according to the latest information collected by the Team. The corresponding wholesale import prices in UK and other European markets are also on an average 50 to 100 cents per master carton less compared to the prices in the Canadian market. Therefore, if Indian producers of canned shrimp can develop the Canadian market a better unit value can be realised.

Problems of the Shrimp Industry

The capacity utilisation in the freezing and canning sectors of the shrimp industry is only 25 per cent and 20 per cent respectively against the ideal economic capacity utilisation which is estimated between 50 to 60 per cent of the installed capacity. The large unutilised capacity is mainly due to the shortage of raw material which is the greatest problem hampering the shrimp processing industry. Of the total requirements of about 150,000 tonnes of raw shrimp to make full utilisation of the capacity, the industry in 1967 was able to procure only about 40,000 tonnes. This problem has become more acute in recent years with the unrestricted growth of processing units unaccompanied by adequate efforts to bring about proportionate increase in shrimp landings. The phenomenon of increased demand for shrimp and its limited supply has resulted in higher prices and unhealthy competition among the processing units. Consequently the ultimate cost of production has gone up. To overcome this problem:

1) It is necessary to take immediate steps to increase the shrimp landings by encouraging fishing units to go in for large trawlers and to tap off-shore shrimp resources with improved gear and equipment. Till such time the trawlers and equipment are made available indigenously and at international prices, it will be necessary to obtain them under suitable arrangement by import, charter or joint collaboration.

2) It is also essential to subject the industry to some sort of regulation or control for its organised development thereby ensuring that the mushroom growth of processing units is checked at least till such time the raw material supplies are augmented. This is important particularly in those areas where there is already heavy concentration of the processing activity. The emphasis should be to establish new units in comparatively under-developed but potential areas for bringing about balanced regional growth.

3) It will also be desirable to set up a suitable mechanism or agency to regulate and stabilise the price of raw material with a view to arresting the price rise beyond un-economic level.

On the processing side the quality of an export product will have to be improved by observing strict in-plant inspection from the stage of boat operation till the processing of the final product. Besides, the present processing methods employed by the industry will need to be improved and the introduction of mechanisation at various stages of processing will have to be attained. The production being wholly export oriented, it is necessary to bring the quality of the Indian product on par with that of its competitors. In order to achieve this, it is necessary to progressively introduce:

(i) (a) Proper handling of shrimp on-board during beheading process and use of ice or chilling at various stages;

(b) mechanisation in the processes of pneumatic unloading, grading and brine chilling;

(c) in-plant inspection at every stage of processing; and

(d) minimum standards to meet sanitary and hygeinic requirements.

(ii) The industry should also take up the processing of new products, such as IQF, breaded shrimp and shrimp paste to meet specific requirements of the importing countries.

(iii) Efforts should also be made to improve packaging and to market directly in the overseas countries.

Export Prospects

With the completion of various projects planned or underway for the development of basic infrastructure envisaging introduction of large mechanised vessels, India would be able to exploit the hitherto untapped shrimp resources in and around Indian seas thereby strengthening its supply base for the processing sector. On the demand side the present trends in regard to the growth in population, income levels and per capita consumption of fishery products, more especially the shrimp, there is every reason to believe that the international demand for seafoods particularly shrimp is bound to increase steadily.

Frozen Shrimp

USA is the principal market for shrimp. Canada, Japan, Australia and the countries of Europe especially UK, France, West Germany and Switzerland are the other main markets. Mexico, India and the Central and South American countries are the principal exporters of shrimp. US imports of shrimp in frozen, canned and dried forms have increased to about 86,000 tonnes in 1968 from 70,000 tonnes in 1964 representing 23 per cent increase during the last 5 years. While 83 per cent of the total shrimp catch of Mexico is exported to USA because of its geographical proximity India's exports to US market represent only 20 per cent of its landed weight of shrimp. The catches of shrimp in Mexico have been steadily declining during the last few years due to the downward trend of the biological cycle and partly on account of its depleting resources. In addition to this, the domestic consumption of fishery products in Mexico is on the increase. Therefore, Mexico would not be in a position to meet the American demand to the extent it has been doing so hitherto. This position can be taken advantage of by the Indian shrimp industry by increasing its share of exports to the US market.

Japan is the second largest market for the import of shrimp. Its imports of this item have more than doubled during the last five years. Mexico, Mainland China, Thailand and India are the main exporters to Japan, India's share to this market being only 9.0 per cent. With increasing purchasing power and with the increasing trend of consumption particularly in view of the declining domestic supply of shrimp in Japan, India has bright prospects to increase its exports in substantial quantities to this market.

USA and Japan also export substantial quantities of shrimp to other countries and would need to import some quantities to maintain their export markets.

Australia has till recently been another market for frozen prawn and shrimp. On account of the development of the shrimp fishing industry in Australia its imports of this product have considerably declined during the last few years. The present imports in this market are mainly of the cooked and peeled variety of smaller prawns and India being the producer of large quantities of this variety has a great potential to increase its exports to Australian market provided, however, the quality of the product is maintained.

Canned Shrimp

US is the main market for canned shrimp and over 20 countries are exporting to this market. India and Mexico together, however, constitute 92 per cent of the total US imports of this product, India's share being 51 per cent. Exports of canned shrimp from India are also directed to UK, France and other European markets where the imports have been by and large increasing both in volume and value. The overseas Survey has revealed that there may not be a substantial increase of this product in the US market for local consumption, markets preference there being for frozen shrimp. But market for canned shrimps are fast developing in European countries where Indian canned shrimp has already established a name. Australia, West Germany, Italy, Sweden and Switzerland are some of the other markets which offer scope for increased trade in this commodity, especially as the trend of imports in these markets has been on the increase during the last three years.

Dried Prawns

Hong Kong, Singapore and Ceylon are the principal buyers of Indian dried prawns. Of the three markets exports from India to Hong Kong and Singapore have shown a substantial increase during the last few years. They have risen from 287 tonnes in 1965-66 to about 12,000 tonnes in 1967-68 for Hong Kong, whereas exports to Singapore during the same period have risen from 29 tonnes to 511 tonnes. On the other hand Ceylon has shown a declining trend while Burma has completely stopped imports of this commodity from India after 1965-66. However, certain new markets like New Zealand, France and Mozambique are emerging fast for the import of this item. India can exploit and develop these potential markets for its dried shrimp export.

Taking into consideration the potential demand for shrimps in frozen, canned and dried forms, the export targets as worked out by the Survey Team by the end of the fourth and fifth-plan periods have been indicated in table A-8.

Table A-8

Export Targets for Frozen, Canned and Dried Shrimp

Qty. Tonnes
Val. Rs million

	1968-69		1973-74		1978-79	
	Qty	Val	Qty	Val	Qty	Val
Shrimp						
Frozen	16,315	180.24	34,200	487.00	53,500	757.00
Canned	2,166	25.45	4,500	53.00	6,600	78.00
Dried	1,076	6.03	1,500	10.00	2,400	16.00
Total	19,557	211.71	40,200	550.00	62,500	851.00

It is envisaged that exports of shrimps in frozen, canned and dried forms in terms of quantity could be doubled by 1973-74 and trebled by 1978-79. On the basis of the past trend, the targets are quite reasonable since during the last five years exports have registered almost 100 per cent rise. At the same time the supply side would be also considerably strengthened with the projected additions of the vessels, implementation of the fishery projects in selected fishing harbours and provision of additional processing facilities. Based on the past trends and the broad indications available for major markets, the Survey Team has made market-wise projections at constant prices for frozen, canned and dried shrimp as indicated in table A-9.

Table A-9

Export Projections for Shrimp by Markets

Qty: Tonnes
Val: Rs million

	1973-74		1978-79	
	Qty	Val	Qty	Val
Frozen Shrimp/Prawn				
USA	20,520	292.00	27,500	403.00
Japan	10,260	147.00	16,000	235.00
Australia	684	10.00	1,000	15.00
UK, West Germany, France, Switzerland and Canada	2,736	38.00	5,500	80.00
Total	34,200	487.00	50,000	733.00

Canned Shrimp

USA	1,350	15.90	1,800	23.40
UK	1,580	18.55	2,100	27.30
France	670	7.90	720	9.35
Canada	230	2.70	480	6.30
West Germany	180	2.10	240	3.00
Switzerland	130	1.55	180	2.35
Italy Netherlands Denmark Belgium Sweden	360	4.30	480	6.30
Total	4,500	53.00	6,000	78.00

Dried Prawn

Hong Kong	750	5.00	1,200	8.00
Singapore	225	1.50	360	2.40
UK	225	1.50	360	2.40
Hawaii	45	0.30	72	0.48
Netherlands	45	0.30	72	0.48
Ceylon Mozambique France New Zealand	210	1.40	336	2.40
Total	1,500	10.00	2,400	16.00

Sardines

Landings. World landings of sardines amounted to 13.5 million tonnes in 1968 against the world fish landings of 64.0 million tonnes. Between 1961 and 1968 world landings of sardines increased from 7.7 million tonnes to 13.5 million tonnes, or at an average annual growth rate of

8.4 per cent. Peru is the largest producer of sardines, accounting for more than 75 per cent. The other main producers are Japan, India, Spain, Morocco, South Africa and Namibia (South West Africa), together accounting for about 19 per cent of the landings. With a catch of 301,400 tonnes in 1968 India ranks fourth among the principal producers.

Exports

Sardines occupy a prominent place in the international trade of fishery commodities with an export of about 3.5 million tonnes in 1967 - 142,000 tonnes in canned form and 3.4 million as fish meal - representing about 26 per cent of the world landings of sardines and 27.4 per cent of the world export of fishery commodities. A review of fish meal exports appears separately.

In addition to the exports of canned sardines, a small quantity of frozen and dried sardines also enters the export trade, though statistical information about these exports is not available. It is, however, reported that Morocco exports frozen sardines to the French Market, while dried sardines are mainly exported by Portugal and Algeria to Cyprus and France.

World export of canned sardines was 142,000 tonnes (valued at $ 78.8 million) in 1967. Portugal with a share of 40.1 per cent dominates the world trade in this commodity. Its export in 1967 was 57,000 tonnes (valued at $ 37.9 million). Other supplying countries include Morocco (35,000 tonnes), South Africa (33,000 tonnes), Spain (10,000 tonnes) and Japan (3,000 tonnes). Of late, Venezuela has also emerged as an important exporter.

A large part of the world trade in canned sardines caters mainly to the requirements of European markets. West Germany, France and UK are the leading consumers absorbing about 80 per cent of the total export. West Germany is by far the largest importer of this item and the bulk of its supplies come from Portugal.

Prospects

Despite the heavy landings of sardines in India, this fishery does not figure in the country's international trade. The small quantity that is canned at present is mainly geared to the national market for meeting civilian and defence requirements to a limited extent. The main reasons for the slow development of sardines are lack of processing facilities, non-availability of suitable types of containers, packing medium like olive oil and the high prices of indigenous cans.

In view of the large potential of sardines off the Kerala and Mysore coasts it should be possible to step up the exports of this fishery by increasing its catch and setting up processing plants for canning. With this end in view, two canning plants, one at Calicut and the other at Mangalore have been suggested with a capacity of 20 and 15 tonnes per day respectively.

In canning sardines, considerable difficulties are experienced regarding the size, type and cost of cans. At present round AI tall can (8 oz. fluid) or flat quarter dingley cans are used for packing sardines. The industry is handicapped in exploiting the export prospects on account of the non-availability of special rectangular cans (402 x 207 x 102) with top soldered and bottom seamed, which has been introduced by Portugal in the international market. The price of this can in India works out to 0.44 paise which is, however, high as compared to the quarter dingley which is available at 0.29 paise per can. Recently, a "Ring Pull Can" for sardines, made of aluminium, has been introduced in the market by Norway, the cost of which works out to about 0.24 paise, and this can is found to be much lighter with better appearance than the three-piece can popularised by Portugal in international market. Besides, the can has a simpler opening contrivance unlike the Portugese can which has to be opened with the help of a specially provided key. In the interest of exploiting the export potential that exists for Indian sardines, it is suggested that this type of can may be made available to the Indian exporters by allowing its import against their entitlement. Simultaneously, efforts should be made by the fabricators in India to manufacture such cans at a price not higher than the present price of the quarter dingley.

The use of refined groundnut oil as packing medium does not seem to be acceptable to some foreign markets, as these markets are used to packing in olive oil or refined fish oil. It will be necessary therefore to allow import of olive oil or alternatively to pack in refined sardine oil itself for which sardine oil extraction plants will have to be set up on an industrial scale.

In view of the intense competition offered by the principal supplying countries like Portugal and Morocco, India can hope to make a dent in the world export trade of canned sardines only if it is able to offer them at a price not higher than 75 paise per can as against 80 paise offered by Portugal and 65 paise by Morocco. With a view to neutralising the price differential, the Government of India may, if need be, offer a cash subsidy.

With the removal of the inhibitory factors and the implementation of the measures outlined above, it should be possible for India to export 1,250 tonnes of canned sardines valued at Rs 13.0 million by 1973-74 and reach a target of 30,700 tonnes to earn foreign exchange worth Rs 93.41 million by 1978-79. On present indications it will be possible for India to export 250 tonnes of sardines (valued at Rs 2.6 million) by 1973-74 and 6,200 tonnes (valued at Rs 18.9 million) by 1978-79 to UK, which is likely to emerge as the principal outlet for this item in air tight containers. Other markets, according to the Survey Team, that offer promise are West Germany, France, Libya, Sweden and East Germany as indicated in table A-10.

Table A-10

Export Projections for Sardines, by Markets

Qty: tonnes
Val: Rs millio

Country	1973-74 Qty	1973-74 Val	1978-79 Qty	1978-79 Val
UK	250	2.6	6,200	18.9
West Germany	187	1.9	4,600	14.1
France	150	1.6	3,000	9.1
Libya	125	1.3	3,200	9.7
Sudan	115	1.2	3,200	9.7
East Germany	110	1.1	3,000	9.1
Poland	125	1.3	2,800	8.5
Others	188	2.0	4,700	14.3
Total	1,250	13.0	30,700	93.4

Tuna

Landings. World landings of tuna rose from 1.2 million tonnes in 1961 to 1.4 million tonnes in 1968 or at an average annual growth rate of 2.1 per cent. Japan is the largest producer of tuna accounting for about 39 per cent of the total landings in 1968 with a production of 545,000 tonnes. USA, Spain and Peru are the other major producing countries accounting for 19.4 per cent of the world production. Taiwan and South Korea, which increased their tuna fleet a few years ago, have also undertaken tuna fishing in a big way and have recorded an appreciable rise in their landings in recent years. Taiwan has increased its landings of tuna from 23,400 tonnes in 1961 to 101,800 tonnes in 1968. The corresponding figures for South Korea are 400 and 43,000 tonnes respectively. In spite of the vast potential of tuna in the Indian Ocean, India's catch of tuna was only about 4,000 tonnes in 1968, harvested mostly from the near-shore waters off the coasts of Tamil Nadu, Kerala and Laccadive Islands.

Exports

World exports of tuna amounted to 189,000 tonnes in 1968, representing about 14 per cent of the total tuna landings and 2.5 per cent of the total fish exports. Of the quantity exported, 64.5 per cent was in frozen form and 35.5 per cent in canned form.

Japan enjoys a virtual monopoly in the export trade of frozen tuna, contributing as much as 87.7 per cent of the total exports in 1968, the balance being accounted for by Peru and France, the former contributing nearly 10 per cent, and the latter 16 per cent. Japan's exports of frozen tuna, after showing a steady rise during 1961 to 1966 fell from 177,500 tonnes in 1966 to 107,000 tonnes in 1968, mainly due to the increased domestic consumption and decline in landings.

World export of canned tuna, emanating mainly from Japan although witnessed a marginal increase in terms of quantity from 66,000 tonnes in 1961 to 67,000 tonnes in 1968, its earnings rose $ 46 million in 1961 to $ 62 million in 1968.

India exports a small quantity (approximately 3 per cent of its total landings) of tuna, in the form of dried and smoked steaks known as 'mas' to Ceylon.

USA is the largest importer of frozen tuna with a share of 30 per cent followed by Italy and Puerto Rico with a share of 22 per cent each. USA, Canada, Italy and West Germany constitute the major consuming markets for canned tuna, with USA taking approximately 40 per cent of the total exports and Canada, Italy and West Germany together accounting for 19 per cent.

Prospects

There is a vast potential for tuna fishery in the Indian Ocean at present exploited by Japan, Taiwan and South Korea on a substantial scale. India has, however, not been able to take advantage of it. With the dearth of fishing vessels and the trained personnel for undertaking deep sea fishing, her tuna fishing has so far been restricted to the coastal waters only. Considering that the development of the tuna fishery will require a huge amount of investment and expertise, the desirability of India entering into collaboration with some of the experienced companies of Japan, Korea or USA for exploiting this fishery - as has been done by countries like Singapore, Thailand, Indonesia and Ceylon - merits serious consideration. Under this arrangement, the collaborating firm can be requested to supply the capital equipment and know-how and assist in the training of the Indian personnel. The collaboration can also be sought for developing the processing and marketing of tuna.

The rising home demand in Japan, which is the largest exporter of tuna, may compel her to divert an increasing proportion of its production to meet the domestic needs. In the circumstances, Japan may not be in a position to meet the growing US demand to the extent that it has done in the past. USA thus offers a potential market for tuna, if India can offer it at competitive prices* and conforming to the international standards of quality.

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* The prevailing wholesale price of tuna in the US market range between $ 12.13 and $ 13.30 per case of 48 cans of 6½ oz. each.

It is envisaged that with proper development, India will be able to make a beginning with the export of 100 tonnes of tuna valued at Rs 0.60 million by 1973-74, and reach 1,200 tonnes valued at Rs 7.20 million by 1978-79. The Survey Team feels that the countries offering scope for Indian tunaare USA, Canada, Italy, West Germany and Japan. Market-wise export prospects of canned tuna for 1973-74 and 1978-79 are shown in table A-11.

Table A-11

Export Projections for Tuna by Markets

Qty: tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
USA	30	0.18	360	2.1
Japan	20	0.12	240	1.4
Canada	15	0.09	190	1.1
West Germany	20	0.12	240	1.4
Italy	10	0.06	120	0.8
Others	5	0.03	60	0.4
Total	100	0.60	1,200	7.2

Bombay Duck

Landings. Bombay duck constitutes one of the major fisheries of India. It is landed in large quantities along the Gujarat and Maharashtra coasts, the important landing centres being Jaffrabad, Rajpura, Umbergaon, Satpati and Versova. It is also caught on the Andhra and Orissa coasts and in the estuaries of West Bengal in small quantities.

Landings of Bombay duck which were 13.7 per cent of the total fish landings of India in 1961 have shown a gradual decline in recent years, being only 8.6 per cent in 1967 and 9.2 per cent in 1968. In terms of actual quantity, landings declined from 93,844 tonnes in 1961 to 82,407 tonnes in 1968 with occasional increases caused by seasonal fluctuations.

About 20 per cent of the catch is consumed in fresh form and the rest is sundried. Sun drying of the fish on scaffolds is the traditional method of preservation on the Maharashtra and Gujarat coasts. The new processing technique of preparing laminated Bombay duck, however, holds out better prospects, and hence in future the emphasis has to be shifted from simple sundried Bombay duck to laminated Bombay duck.

Exports

Only a negligible portion (about 0.3 per cent) of the sundried product enters the export trade of India, while the rest is marketed internally. Exports of Bombay duck, amounted to 216 tonnes in 1967. Mauritius, Kenya, Uganda, Tanzania, Ceylon, Singapore and Indonesia were the principal markets. Its average price realisation in these markets is Rs 3 per kilogram. Laminated Bombay duck has a good market in the UK where it fetches a price of Rs 10 per kilogram.

Prospects

The survey has revealed that there is good potential for the export of laminated Bombay duck in Europe and USA where it can be popularised as a snack in the bars and fetch a good price provided its quality can be improved by the adoption of improved methods of processing, e.g. by the introduction of mechanical handling and drying to maintain its freshness and crispness. With a view to facilitating this, project proposals have been recommended by the Survey at three centres, namely, Jaffrabad, Umbergaon and Versova.

It has been noticed that after each haul the fishes are piled upon the deck in a dump instead of arranging them side by side in a systematic manner. Thus the fishes subjected to heavy pressure on the bottom layers are damaged. This also happens at the time of storage of the finished product prior to final shipment. It is also necessary to protect the fish from infection by insects and maggots. For this purpose it is essential that the product after processing, is oven dried and sealed immediately in polythelene bags and then packed.

Special care needs to be exercised with regard to packing of Bombay ducks. The product should be packed in polythelene-lined double gunny bags to prevent absorption of moisture in transit. The master cartons in which laminated Bombay ducks are packed at present also need considerable improvement, so that the contents within are preserved in quality and shape. At present 25 laminated Bombay ducks are packed in an individual carton which is too large for the number, and consequently there is a certain amount of squashing of the cardboard containers which damages the appearance and affects the value of the product. A suitable outer-case will obviate the crushing. This can be achieved by using larger number of the product or reducing the size of the box.

The entire quantity of laminated Bombay duck can find an export market, if strict hygienic conditions are maintained and suitable packaging is resorted to. It is envisaged that India will be able to realise an export of 3,100 tonnes (valued at Rs 14.40 million) by 1978-79 if the steps outlined above are implemented.

Lobsters

Landings: World catch of lobsters has witnessed a steady and moderate rise. It rose from 114,000 tonnes in 1961 to 146,000 tonnes in 1968, witnessing an average annual growth rate of 1.7 percent. Spiny lobster, which constitutes the most important variety is found mainly in the seas around Australia, Cuba, South Africa, Japan and India. Its catch increased from 52,000 tonnes in 1961 to 61,000 tonnes in 1968, thereby registering an increase of 17.3 per cent. Australia, which is the leading producer of spiny lobster, contributed about 25 per cent of the total catch of this variety. Its catch increased by about 21 per cent during the period 1961-68. Australia is followed by Cuba and South Africa accounting for about 15 and 11 per cent respectively of the total catch of spiny lobster. The total catch of northern lobster was 32,000 tonnes in 1968. Canada contributed about

53 per cent of it followed by USA accounting for about 46 per cent. Landings of northern lobster witnessed a marginal fall of 6.7 per cent during 1961-68. Catch of Norway lobster rose by 33 per cent from 24,000 tonnes in 1961 to 32,000 tonnes in 1968. The major producing countries of this variety are UK, France and Spain. Chile is the only country producing squat lobster.

India produces only the spiny lobster. It is found along the rocky coasts of the States of Tamil Nadu, Andhra Pradesh and Kerala, with areas off Colachel and Kanyakumari in Tamil Nadu as the main fishing grounds. Recently this fishery has been organised on the Saurashtra coast and near Mandapam in the Gulf of Mannar. No detailed statistics about the lobster catch in India are available. Assuming that lobster constitutes about 50 per cent of the catch of "other crustaceans", it can be estimated that total catch of lobster in 1968 was approximately 1,800 tonnes.

Exports

Lobster occupies a prominent place in the international market. In 1968, its total export was 23,300 tonnes (valued at $ 68.8 million). Approximately

98 per cent of the exports are effected in frozen form, while a negligible quantity (1 per cent) is exported as canned. Canada (8,800 tonnes), South Africa (5,900 tonnes) and Australia (5,000 tonnes) constitute the major exporters of frozen lobster with their combined share amounting to about 85 per cent of the world exports. Mexico, Denmark, Brazil and Norway come next in order of importance. Bulk of the exports are directed to USA. Netherlands, Sweden and France also take small quantities. A beginning was made by India in the export of this item in 1963 and since then exports have gone up. Exports of lobster tails from India have shot up from 53 tonnes in 1963 to 297 tonnes in 1968. Its share in the exports of marine products from India, is, however, still very small. USA constitutes the major market for Indian lobster tails although its share in the total US market is only 1 per cent. Other major suppliers to the US market - in order of importance - are Canada (28 per cent), South Africa (18.7 per cent), Australia (18.2 per cent), New Zealand (10.2 per cent) and Brazil (5.8 per cent).

The prices realised by Indian lobster tails for comparable grades in the US market have been lower than those realised by the competing countries. Australia, South Africa and Brazil realise higher prices for their products as they endeavour to export bigger varieties by discouraging catching and processing of small ones. Further, the policy of marketing of one or two selected brands through sales organisations has assisted the export effort of South Africa and Australia considerably.

Prospects

With a rising world demand and the location of additional sources of lobster both along the coasts and in deep sea, it should be possible for this fishery to make an increasingly larger contribution to the total trade of marine products of the country. The Indo-Norwegian project has located good concentrations of lobsters in the deep sea area off Kerala at a depth of 200 to 300 metre. Fishing for lobsters from the deep seas would necessitate introduction of larger vessels of over 22 m. length. This would strengthen the resource base necessary for exporting and cultivating the potential markets available for Indian lobster tails abroad. Besides, it would also be necessary to ensure the high quality of the product and to arrange for its proper grading and packaging. The product should be brought under compulsory quality control. With the introduction of right type of fishing gear and improvement in the quality of the product, it would be possible for India to increase the export of this item from 393 tonnes in 1968-69 to 500 tonnes in 1973-74 and to 2,458 tonnes by 1978-79 yielding a return of Rs 12.0 million and Rs 43.50 million in foreign exchange respectively. The market-wise export projections for this item are given in table A-12

Table A-12

Export Projections for Lobsters, by Markets

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
USA	400	9.60	1,966	34.80
Scandinavia	40	0.96	198	3.48
UK	30	0.72	147	2.61
Spain	30	0.72	147	2.61
Total	500	12.00	2,458	43.50

Mackerel

Landings. Mackerel, a pelagic shoaling fish occuring in three principal species such as Indian mackerel, Spanish mackerel and King mackerel, is found mainly in the

Indo-Pacific and Atlantic Oceans. Mackerel landings of the world in 1968 amounted to 2.3 million tonnes against the total world fish landings of 64.0 million tonnes. Between 1961 and 1968 landings of mackerel increased significantly from about 0.8 million tonnes to 2.3 million tonnes or at an average annual growth of 16.3 per cent. Japan, which is the leading mackerel producing country in the world contributed nearly 45 per cent of the total landings. Its landings in 1968 amounted to 1,035,000 tonnes. Japan is followed by Norway, accounting for more than 33 per cent. Thailand, Malaysia, South Africa, France and India are the other mackerel producing countries, contributing 18 per cent to the total world landings. Although landings in these countries constitute a negligible proportion of the total landings, their growth rate, barring India, has shown a sharp rise during the period 1961 to 1968. India's landings of 'Indian Mackerel' - the only species found along the west coast extending from Ratnagiri to Kanyakumari- showed a decline of about 37 per cent between 1961 and 1968. Mackerel landings in India in 1968 were 21,703 tonnes, i.e. less than 1 per cent of its world landings.

Exports

Exports of mackerel in 1968 were 140,600 tonnes, (valued at $ 47 million). Approximately 88 per cent of export takes place in canned form while 10 per cent in frozen and 2 per cent in dried.

Exports of canned mackerel recorded a sharp rise both in terms of quantity and value during the period 1961 to 1968, the former from about 22,000 tonnes to 123,000 tonnes, or at an average annual growth rate of 27.6 per cent and the latter from $ 8.4 million to $ 40.0 million or at an average annual growth rate of 25 per cent.

Japan is the largest exporter of canned mackerel, accounting for more than 94 per cent of the total export in 1968. Its exports have risen significantly from about 10,000 tonnes in 1961 to 116,800 tonnes in 1968, or at an average annual growth rate of 42 per cent. Japan is followed by Morocco, contributing about 5 per cent to the world exports in 1968. The other important suppliers of this item are Portugal, France, Norway and USA.

Philippines, Italy, USA and Belgium constitute the major markets for canned mackerel. The offtake of these countries is more than 50 per cent of the total export. In 1968, about 58 per cent of Japan's export was marketed in Philippines, while Italy was the major market for France and Portugal.

Norway, Japan and Canada are the major exporters of frozen mackerel. Exports of frozen mackerel were 14,400 tonnes valued at $ 2.5 million in 1968. Norway is the leading exporter of this product, with a share of more than 72 per cent in 1968. USA and Czechoslovakia comprise the major consumers of this item.

In India about 20 per cent of the catch is salt-cured or pickled, of which a small quantity is exported to Ceylon. About 5 per cent is canned for sale within the country and for supply to the defence establishments. The remaining portion (75 per cent) is consumed in fresh form. Sometimes mackerel is beach dried and converted into manure.

Prospects

There is considerable potential for the export of canned mackerel in the world market and this trend is likely to continue in the future. India's export of this item has been practically nil. In view of the large market potential and the abundant resources available for the supply of mackerel, it should be possible for India to realise an export of 100 tonnes of canned mackerel by 1973-74 and eventually to reach the target of over 5,000 tonnes by 1978-79 enabling the country to earn foreign exchange worth Rs 0.40 million by 1973-74 and Rs 27.14 million by 1978-79. The market-wise export projections as worked out by the Survey Team are shown in table A-13.

Table A-13

Export Projections for Mackerel by Markets

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
Poland	25	0.10	1,200	5.6
UK	20	0.08	1,000	4.6
Libya	15	0.06	900	4.2
Sudan	10	0.04	850	3.9
East Germany	10	0.04	800	3.7
Others	20	0.08	1,104	5.1
Total	100	0.40	5,854	27.1

With a view to developing this fishery to reach the target envisaged above, fishing operations will have to be organised by the use of purse-seines in regions of Kerala, Mysore, Goa and Maharashtra on a large scale. The results of pelagic fishery project, proposed with the UNDP assistance, will be of considerable benefit to increase the range and duration of fishing operations.

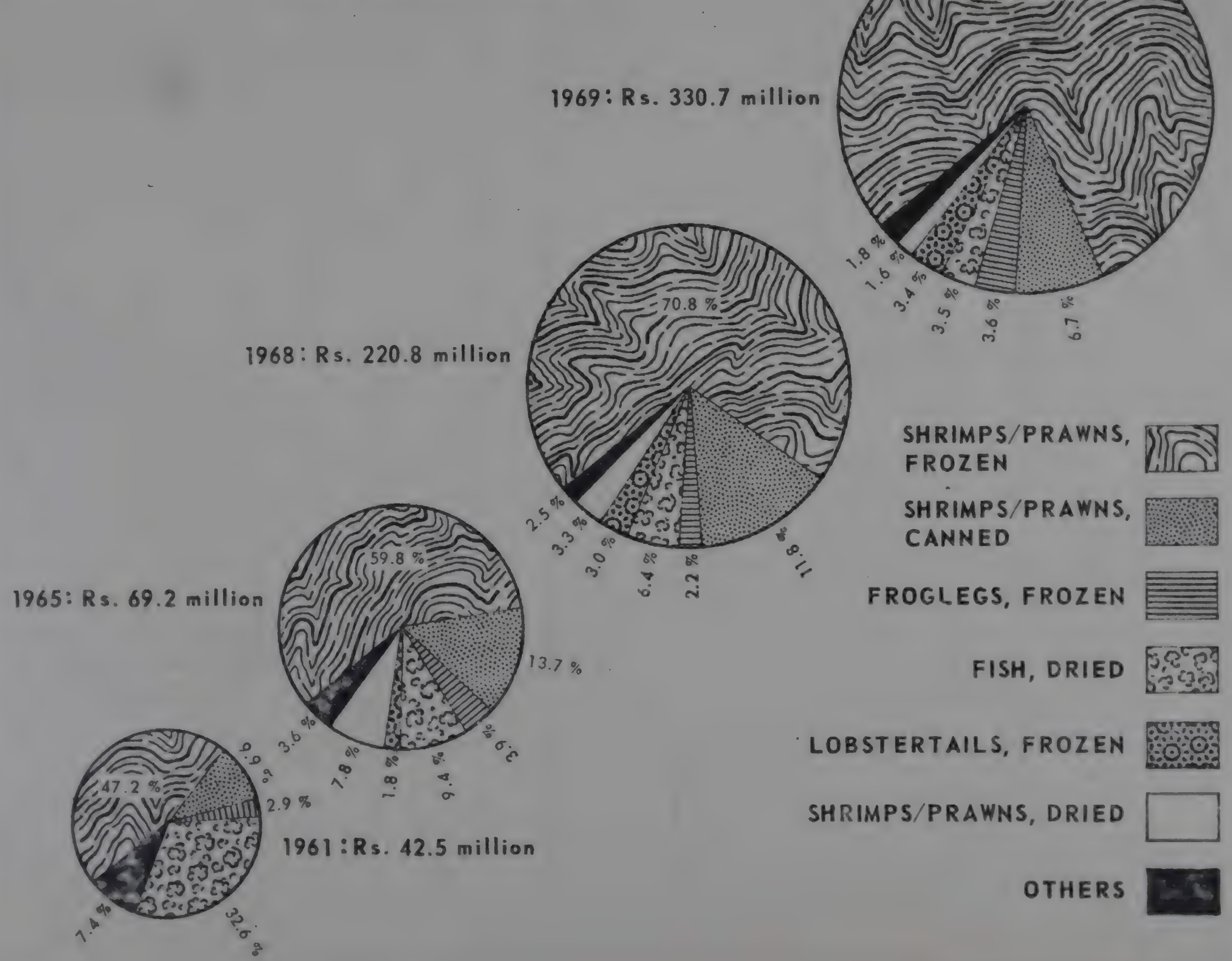
Eel

Landings. Japan, India, Hong Kong, China (Taiwan) and South Korea are the major eel producing countries of the world. This fish is also caught in small quantities in Netherlands, Denmark and Sweden. In India is occurs mainly on the northwest coast during the months from August-October. World landing of eels amounted to 45,000 tonnes in 1968, against the total fish landings of 64.0 million tonnes. Its production has evinced a gradual decline in recent years. Landings in Japan, which is the leading eel producing country, accounting for more than 53 per cent, fell by about 28.7 per cent from 33,700 tonnes in 1961 to 24,000 tonnes in 1968. India which ranked second in the world landings in 1961 came to occupy the fifth position in 1968, when its production fell from 11,400 tonnes in 1961 to 3,400 tonnes in 1968. On the other hand, Korea's production increased from a low base of 1,000 tonnes in 1961 to 8,300 tonnes in 1968. Hong Kong and China (Taiwan) showed marginal increases in their respective landings.

Exports

Eels do not figure prominently in the international trade of fishery commodities. A very insignificant portion of the catch enters the export trade in canned, frozen

COMPOSITION OF MARINE PRODUCTS EXPORTS FROM INDIA
(Post – Devaluation Rupee)



Chart–5

and smoked form. The fish is mainly domestic market oriented. Detailed information about the world trade of the fish is not available. However, it is reported that a small quantity of the fish is exported from Netherlands and Denmark to UK and West Germany.

So far there has not been any export of eels from India. The entire catch is consumed in the domestic market mainly in fresh and dried forms. The air bladders from eels are dried and exported as fishmaws.

Prospects

No effort has so far been made to export eels from India. Export prospects for smoked and canned eels in the world market can be fully exploited in view of the large eel fishery along the north west coast. Particular attention should be devoted for increasing the catch and taking up its canning at important centres. It is recommended elsewhere that the proposed canning factories in Bombay and Veraval should take up canning of eels also. Simultaneously market surveys should be conducted in some of the continental countries and USA for a long-term export programme. It is reported that the trial consignments of eels, smoked and canned, have been received well in Denmark, West Germany, USA, and Poland.

If concerted efforts are made to step up the production and export of eels as indicated above, the Survey Team estimates that India can achieve the level of export performance of 100 tonnes valued at Rs 1.00 million by 1973-74 and 1,200 tonnes valued at Rs 13.08 million by 1978-79, destined to the markets indicated in table A-14.

Table A-14

Export Projections for Canned Eel, by Markets

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
Denmark	25	0.25	260	2.7
Poland	20	0.20	240	2.6
West Germany	15	0.15	230	2.5
Sweden	13	0.13	150	1.6
USA	12	0.12	120	1.4
Japan	12	0.12	130	1.4
Others	3	0.03	70	0.8
Total	100	1.00	1,200	13.8

Frozen Fish
(Pomfret, Seer fish and Perches)

Although Indian fish catch includes a wide variety of commercial fishes, there has been no organised effort so far for processing and exporting them on a large scale. The prospects offered by a few selected varieties for freezing and export are discussed in the following paragraphs.

Pomfrets

Pomfrets are exclusively found in abundance in the Indian seas. Small quantities are also caught in the seas off Cambodia and Thailand statistical information on which is not available. With a catch of 28,206 tonnes in 1968, pomfrets accounted for a little over 3 per cent of the total marine fish landings in India. The fishery is concentrated mainly along the coasts of Gujarat and Maharashtra. These two States contribute together about 60 per cent of its total landings.

Export

Pomfret is at present mostly marketed internally in fresh form as the price in the domestic market is very attractive. Only in recent years, attempts have been made to export limited quantities in frozen from to Japan and in fillets to USA. Although separate statistics are not available, it is understood that in 1967-68 its exports were roughly about 1.5 tonnes valued at Rs 15,000.

Seer Fish

In 1968, world landings of seer fish amounted to 84,000 tonnes as against 64.0 million tonnes of the world fish landings. Japan is the largest producer of seer fish with a share of about 24 per cent. In 1968, its landings were of the order of 20,000 tonnes. India ranked second with a catch of 13,352 tonnes and contributing 15.4 per cent. Other major producing countries include Mexico, Venezuela and Malaysia. The landings of this fish in India constitute approximately 9 per cent of the total all-India marine fish landings. Seer fish in India is concentrated off the coasts of Maharashtra, Tamil Nadu and Andhra Pradesh. The latter two States together accounted for 48 per cent of the catch in 1968.

Exports

Seer fish is consumed mainly in fresh form. Statistics regarding world trade of the fish are not available. However, Japan and Mexico are considered to be the major exporters of this fish.

Though India is one of the major seer fish producing countries of the world, there is hardly any export, except for small quantities in filleted form intermittently sent to USA, Singapore and Japan or in dried form to Ceylon.

Perches

Australia, Canada, West Indies and Japan are the major producers of perches. However, the fish is also caught in small quantities in India. Detailed information of landings of perches in various countries is not available.

The landings of the fish in India are at present very small. The catch of 10,425 tonnes in 1968, contributed a little over 1 per cent to India's marine fish landings of 9,32,765 tonnes. It is caught mainly off the coasts of Tamil Nadu and Kerala.

Export

World trade of perches takes place only in frozen form, either as whole or in fillets. Canada is the leading exporter followed by Australia. In 1968, Canada shipped about 23,000 tonnes (valued at $ 11.7 million) of frozen perches. Almost the entire consignment was shipped to USA. Except for a very negligible quantity in frozen form, perches do not figure in the export trade of India.

Prospects

Although, India has the requisite resource base, exports of fishes like pomfret, seer and perches have been relatively insignificant. These fishes offer considerable scope for exports as frozen fillets or whole. The main reasons for which it has not been possible to process and export these fishes are the lack of freezing facilities at important centres and the high price it fetches locally. The prime need for developing this trade is to establish a few freezing units at important landing centres equipped with modern beheading and filleting machines.

Foreign visitors who have tasted these fishes especially pomfrets in India have found them as tasty as pompano in the United States. It is expected that these fishes will command greater consumer preference in the American and European markets. What is, however, needed is to popularise them in the American and continental markets by organising exhibitions and sales promotion campaigns. Besides, necessary steps need to be taken for meeting the foreign market requirements in respect of quality, grade, standards, packaging and delivery schedules. In view of the high quality of the fishes, it is felt that promfrets, perches and seer could be marketed effectively in countries like UK, USA, Scandinavia, Singapore, West Germany and Japan if it can be offered at 62 cents per lb. for frozen whole and 82 cents per lb. for fillets. It is envisaged that about 100 tonnes (Rs 0.90 million) of export can be achieved by 1973 and a target of 27,730 tonnes reached by 1978-79 to earn foreign exchange worth Rs 83.1 million from the markets shown in table A-15.

Table A-15

Export Projections for Frozen Fish, by Markets

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
Japan	25	0.22	6,930	20.8
USA	15	0.13	4,110	12.5
UK	14	0.13	3,880	11.6
Scandivania	13	0.12	3,610	11.2
Singapore	10	0.90	2,770	8.3
West Germany	9	0.08	2,490	7.5
East European Countries	10	0.09	2,780	8.5
Others	4	0.04	1,100	2.7
Total	100	0.90	27,730	83.1

Crab

Landings. World catch of crab has increased from 237,500 tonnes in 1961 to 354,000 tonnes in 1968, or at an average annual growth rate of 5.9 per cent. USA is the largest producer of crab followed by Japan. In 1968, USA accounted for 109,000 tonnes or about 31 per cent of the total catch. It virtually monopolised the entire catch of blue and dungenese crab. USSR and Japan, the major producers of king crab contributed 40,000 tonnes and 118,000 tonnes respectively to the total catch. Other important crab producing countries are Thailand, China (Taiwan), France, Malaysia, South Korea, Mexico and Spain.

Compared to the catch in major countries, India is only a fringe producer of crab at present. The most familiar species in India is Scylla serrata which is similar to the king crab in taste and are found all along its coast during August-October.

Exports

Of the total world export of crab of 14,000 tonnes (valued at $ 41.4 million) in 1968, 95 per cent comprised canned crab meat, while the remaining 5 per cent was exported as frozen. Japan, the leading exporter of canned crab meat with 4,700 tonnes (valued at $ 15.4 million) in 1968, accounted for more than 35.3 per cent of the total exports, followed by USSR exporting 4,700 tonnes in 1968. Other major exporters are USA (2,100 tonnes) and Norway (1,700 tonnes). A negligible quantity of frozen crab meat enters into the export market from Malaysia and Cambodia.

UK, USA, France, Sweden and Belgium constitute the major markets for canned crab meat, accounting for over 75 per cent of the world imports. UK alone absorbs over 1/5th of the world imports.

Prospects

Although crab occurs in large quantities all along the Indian coasts and in back waters and brackish water lakes like Chilka and Pulicat it has not yet developed into an exclusive fishery, as no organised effort has so far been put forth for commercial exploitation. The present negligible catch is consumed locally by the people living in the coastal areas. Efforts should be intensified to catch crabs by introducing suitable techniques all along the Indian coast and for collecting them for processing. In view of the availability of good quality crabs in Chilka lake, it is proposed that a processing unit provided with freezing and canning facilities may be set up at Balugaon near Chilka lake in Orissa, for processing crabs and shrimps. It is reported that the crab found in Chilka lake compares well with the king crab, and can have a very good market in the USA, Scandinavia, France and UK. While exporting crab meat, measures should be taken to see that the claw-meat is separately processed from the body meat, as the former has a higher price advantage than the latter.

Oyster

Landings. Oyster occupies an important place among the food resources of the sea. It occurs mainly in the coastal areas of Indo-Pacific ocean. USA (Pacific) and Japan constitute the major oyster producing countries of the world. Other important countries include France, Netherlands, South Korea, Mexico and Australia. World oyster catch increased from 731,000 tonnes in 1961 to 823,000 tonnes in 1968 or at an average annual growth rate of 1.7 per cent. USA is the largest oyster producing country, contributing 388,700 tonnes to the total production in 1968. Japan which ranks second, showed an increase of nearly 55 per cent between 1961 and 1968 when its production increased from 172,900 tonnes to 267,500 tonnes. Mexico's production of oyster evinced a sharp increase of about 85 per cent during 1961-68 when it increased from 19,200 tonnes to 35,500 tonnes. Statistical information about oyster catch in India is not available. It is reported that these are found mainly in the coastal areas of Gujarat, Maharashtra, Tamil Nadu and Mysore, and in the backwaters of West Bengal, Orissa and Kerala.

Oysters are harvested by dredging, tonging or picking. The particular method employed varies considerably with the geographical location of the oyster beds. On the Pacific coast most of the oysters are harvested by dredgers, while tonging is done in relatively shallow waters usually where the oysters are more scattered or are in small beds. In picking, collectors walk over the surface of the beds when the tide is out, and pick up the oysters.

In view of its importance as a food item, oysters are cultured by many countries for domestic consumption as well as for exports for supplementing the supply from the sea resources. Japan is the leading country in the world which has developed large scale oyster culture both for food and seeds.

Exports

International trade of oyster takes place both in frozen and canned form. Out of the total exports of 17,500 tonnes (valued at $ 11.1 million) in 1968, 68 per cent comprised frozen oysters and 32 per cent canned. In 1968, exports of frozen oysters amounted to 11,900 tonnes, of which Portugal alone accounted for 86.5 per cent. The remaining 32 per cent was shared by Japan, Netherlands, Canada and South Korea. Exports of canned oyster increased from 3,500 tonnes (valued at $ 2.9 million) in 1961 to 5,600 tonnes (valued at $ 6.3 million) in 1968, or at an average annual growth rate of 7 per cent in terms of quantity, Japan is the sole supplier of canned oyster to the world markets. France, USA, Belgium and UK constitute the major markets for frozen oyster, with France alone absorbing as much as 64 per cent of the total export. Canned oyster is marketed mainly to USA and Canada.

Prospects

Although oysters occur in large quantities in India, no effort has so far been made to process and export them. They are at present consumed mostly by the local population living along the coastal areas.

In view of the growing demand for oysters all over the world, India can have an appreciable share in the export trade provided efforts are made for their systematic exploration for export to promising markets like USA, UK, Belgium and France at a competitive price.

Froglegs

Frogs are caught in large quantities in Japan, Cuba, Mexico, India, Yugoslavia and Taiwan. Detailed statistical information on world catch of frogs is not available. Japan is, however, the leading country in the production of frogs. In India, frogs are available in almost all swampy and low lying areas in Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Assam, West Bengal and Orissa.

Exports

Only the hind legs of the frog figure as an item of international trade. They are considered a great delicacy in the overseas markets and exported in frozen form.

Japan, Cuba, Taiwan and Yugoslavia are the major exporters of froglegs to the world markets. In recent years, India has also emerged as one of the leading suppliers of this item and has made significant progress. In 1963, India's export of froglegs was about 514 tonnes valued at Rs 3.2 million. In 1967, its exports reached a peak of 786 tonnes valued at Rs 8.82 million. This, however, suffered a set back in 1968 when there was a drop of 42 per cent in terms of quantity and about 45 per cent in terms of value, over the peak reached in 1967. But in 1969, the export, again increased to 854 tonnes valued at Rs 11.90 million.

USA and France are the principal buyers of Indian froglegs. Till 1965 their combined offtake was more than 99 per cent of India's exports. Since 1966, India has started exporting froglegs to Belgium, Italy, West Germany and Switzerland also and their share has been steadily rising, from 6.7 per cent in 1966, to 11.4 per cent in 1968. USA has been the largest market for Indian forglegs. But on account of the stiff competition offered by Japan, India's share in US market has been declining gradually. Next to USA, France is an important market for this item, where exports registered a steady rise till 1967. But towards the end of that year, the French veterinary authorities detained certain consignments on bacteriological grounds causing a temporary set back. The difficulties were, however, overcome by complying with the French standards and by certifying that the goods had been inspected and were upto the requirements of the French authorities. The latest reports indicate that the French authorities are now satisfied with the quality of Indian froglegs. Thus, India is now in a better position to exploit the scope for exports in the French Market. In 1969, Belgium became the second largest importer of froglegs from India contributing 27 per cent by quantity and 31 per cent by value as against 49 per cent and 41.7 per cent by USA and 22 per cent and 25 per cent respectively by France.

Prospects

The supply of forglegs has not been able to catch up with the demand so far. There is thus need for strengthening the production base by under-taking frog culture experiments on a large scale. It is reported that experiments are being conducted by some State Fisheries Departments and Central Inland Fisheries Research Institute, Barrackpore. If these experiments prove successful, these will lead to large scale farming of frogs. In addition, efforts should be made to organise collection of frogs in a systematic manner and for freezing them at suitable collection centres.

In view of the high prices offered by the processors, even frogs of small sizes are being collected at present inhibiting the fuller growth of frogs. This is disadvantageous for smaller the size the lower will be the unit value realisation. Hence it is suggested that froglegs of counts below 80 per kg. should not be allowed to be exported and a ban to this effect imposed. With a view of conserving the frogs, catching of frogs during their breeding season (June to August) should be prohibited.

Strict adherence to quality standards, proper grading and improvement in packaging will also help to boost the exports of frozen froglegs from the country and fetch higher prices. At present Indian froglegs fetch the lowest price. The highest price goes to Japan. The average price of the Indian 'Jumbo' in the US market in September 1969 was 117.5 cents per pound as against 135 cents for the Japanese product. Similarly the 'Large' grade fetched 117.5 cents per pound for India and 142.5 cents per pound for Japan.

The Survey Team feels that if the steps outlined above are initiated, it will be possible to increase the exports of froglegs from 565 tonnes in 1968 to 900 tonnes in 1973-74 and eventually to build-up an export trade of

1,000 tonnes by 1978-79 to realise foreign exchange worth Rs 10.35 million by the end of Fourth Plan and Rs 11.50 million by the end of the Fifth Plan. USA, Belgium and France are the principal markets for froglegs. In addition, Italy, West Germany and Australia also hold out good prospects for exports. The export projections of this item in the major markets during the Fourth and Fifth Plan are given in table A-16.

Table A-16

Export Projections for Froglegs, by Markets

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
USA	315	3.62	350	4.02
France	325	3.73	370	4.23
Belgium	225	2.59	250	2.88
Others	35	0.41	30	0.37
Total	900	10.35	1,000	11.50

Fishmeal

Production. In 1968, world production of fishmeal was 3.9 million tonnes as against 2.2 million tonnes in 1961. Peru is the leading fishmeal producing country in the world, accounting for about 50 per cent of the world production in 1968. Other important producing countries are Norway South and South-West Africa, Chile, Iceland and Angola, accounting for a further 30 per cent of the total production.

Production of fishmeal from Peru registered a substantial increase from 0.8 million tonnes in 1961 to 1.9 million tonnes in 1968, an annual increase of 81 per cent. Chile, South and South-West Africa produced considerably more fishmeal in 1968 than in 1967, the increase in percentage being 43 for Chile and 36 for South and South-West Africa. The output of Norway which had recorded an appreciable rise between 1961 and 1967 was down by nearly one fifth in 1968. It is reported that the drop in the catch of herring in 1968. was the major cause for the lower production in Norway. India's production of fishmeal is negligible. The total production is estimated at 8,000 tonnes per year, which is mainly consumed in the domestic market as poultry feed. The slow development of the industry is mainly attributed to the inadequate and irregular supply of cheap shoaling fish.

Exports

Fishmeal occupies a prominent place in the international trade of fishery by-products with an export of well over 3 million tonnes, representing 64 per cent of the world output of fishmeal. Bulk of these exports originate from Peru, South and South-West Africa and Iceland and are directed mainly towards USA, West Germany and Netherlands. Between 1961 and 1968 world exports of fishmeal rose from 1.2 million tonnes (valued at $ 103 million) to about 3.4 million tonnes (valued at $ 374 million) or at an average annual growth rate of 18.9 per cent. Peru dominates the world fishmeal trade, and had a share of about 61 per cent in 1968. Its exports increased from 0.7 million tonnes (valued at $ 75 million) in 1961 to about 2.0 million tonnes (valued at $ 204 million in 1968, or at an average annual growth rate of 16.2 per cent. Most of its exports go to USA. The second major exporter is Norway which shipped 495,000 tonnes in 1967. About 30 per cent of Norway's meal was directed to the US market, its other markets are UK, West Germany, Belgium and France. While South and South-West Africa supply nearly 10 per cent of the world requirements, the share of Denmark is about 6 per cent. The main reason for the rapid expansion of fishmeal in international trade is due to the increased catch of "anchovies" off Peru coast. Since the domestic market with a high price of fishmeal exercises a pull, exports from India have been negligible and intermittent. It exported 118 tonnes in 1965-66 and 295 tonnes in 1968-69 to West Germany.

Prospects

Under the present condition of inadequate and irregular supply of raw materials at high prices, export prospects of fishmeal may not seen to be bright. The only raw material utilised at present in the trash fish from shrimp trawlers. The present price of raw material at the landing place ranges between Rs 180 and Rs 250 per tonne. With about 20 per cent towards processing cost, one tonne of finished meal costs a minimum of Rs 1,080, whereas the international FOB price works out to Rs 800 per tonne thereby making Indian product uncompetitive in foreign markets. India can hope to make a dent in the international market only by reducing the cost of raw material and developing large scale processing of fish and making the trimmings available to the fishmeal industry at a low price. This alone would bring the production cost in line with the prices prevailing in the international market.

The rapidly growing demand for fishmeal in the world market and the large potential available for sardine fishery on the west coast offer India an excellent opportunity for entering the world trade in fishmeal. For this purpose, it is essential that fishmeal plants should be set up at important centres like Calicut, Cannanore and Mangalore, where there are good concentrations of sardine besides the scope for obtaining trash fish in good quantities. Miscellaneous varieties of cheap fishes like silver belly, sciaenids, and other small fishes landed by shrimp trawlers, which do not find a ready market can also serve as raw materials for the reduction industry. In addition to this, efforts should be made for the proper collection of wastes in the form of heads and other trimmings from the freezing and canning units, for utilising them as raw material for the fishmeal plants.

Taking into account the growing world demand and the measures suggested above for developing the fishmeal industry on a large scale, it should be possible for India to develop an export trade of 500 tonnes valued at Rs 0.5 million by 1973-74, and eventually reach a target of 7,330 tonnes by 1978-79 valued at Rs 6.97 million. The countries that offer scope for exporting fishmeal from India are West Germany, East Germany, Poland, Netherlands, and Italy. Recently Spain has also shown interest in importing fishmeal from India provided strict adherance to international standards, regularity of shipments in quantities not less than 5,000 tonnes at a time, and good packing in moisture proof bags can be ensured. The export projections of fishmeal from India in the major markets during 1973-74 and 1978-79 are indicated in table A-17.

Table A-17

Export Projections for Fishmeal, by Markets

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
West Germany	175	0.18	2,300	2.25
East Germany	150	0.15	2,100	1.98
Poland	125	0.12	2,000	1.85
Others	50	0.05	930	0.89
Total	500	0.50	7,330	6.97

Fish Oil

Production. World production of fish oil increased considerably from 0.6 million tonnes in 1961 to 1.1 million tonnes in 1968, witnessing an increase of 84 per cent. Norway, Peru, Iceland, Denmark and USA are the major fish oil producing countries in the world. Norway's production of fish oil has increased by an annual growth rate of 16.6 per cent from a low level of 77,000 tonnes in 1961 to 337,400 tonnes in 1968. Its share in the world production has increased from 13 per cent in 1961 to 21 per cent in 1968. Peru is the largest fish oil producting country contributing 30 per cent to the world production. Its production increased from 118,900 tonnes in 1961 to 349,000 tonnes in 1968, registering an annual growth rate of 16.6 per cent. Iceland, Denmark and USA together account for more than 17 per cent of the total together.

India's share in the total production is negligible. Statistics regarding India's production of this item are not available. However, it is understood that production is roughly of the order of 3,000 tonnes per annum.

Exports

Fish oil is divided into two main categories - fish liver oil and fish body oil. The former is used for medicinal purposes and the latter is at present mainly used as a preservative for boats. The present method of extraction of fish oil used in India being crude the product is of a poor quality. It is understood that if the oil could be extracted by the improved methods in use in some of the foreign countries it will considerably improve the quality of the product which can be used for the preparation of a variety of industrial products such as factice (rubber filling compound), water repellant paints, printing ink and lubricating oil additive. Hydrogenated fish oil can also be considered for use in soap or for margarine production. Refined and slightly polymerised fish oil is used for canning of fish in Norway.

World exports of fish oil were 684,000 tonnes (valued at $ 58 million) in 1968 as against 335,000 tonnes (valued at $ 51 million) in 1961. More than half of the exports is accounted for by Peru and Norway. Peru is the largest exporter of fish oil contributing 45.3 per cent to the world exports followed by Norway with a share of

12.5 per cent. Iceland (33,800 tonnes), USA (29,500 tonnes), Denmark (56,400 tonnes) and South West Africa (73,800 tonnes) are other important exporters accounting for a further 31 per cent. In 1968 exports of fish oil from Peru and Norway were of the order of 310,600 tonnes and 85,000 tonnes respectively. A major part of the exports is absorbed by West Germany (21%) and Netherlands (22%). Denmark, Belgium and Sweden constitute other important importers of fish oil.

India's exports of fish oil during 1968-69 were about 148 tonnes (valued at Rs 246,000), and were directed towards the Middle East countries with Kuwait, Iraq, Trucial Oman and Bahrein as major customers.

Prospects

Elsewhere, proposals have been made for increasing the catch of sardines by engaging in off-shore fishing on a large scale with the object of taking up the processing of sardines and/or preparation of fishmeal for export aboroad. As the Government of India has placed a ban on the import of olive oil, the canning of sardines is at present being undertaken in the packing medium of ground nut oil. The Survey has revealed that the foreign consumers prefer olive oil or fish oil to groundnut oil.

Since it would be more economical to use fish oil for the canning of sardines, it is suggested that the plants that are installed for the preparation of fish meal from sardines should be of the composite type which could simultaneously produce oil along with the production of fishmeal.

Fishmaws and Sharkfins

Fishmaws are dried air bladders of fish. Indian salmon, jew fish, cat fish and eels are the important varieties of fishes that yield quality air bladders and serve as important raw material for fishmaws. Sharkfins are the candal, dorsal, and pectrol fins of the bigger species of sharks.

Data on world production of fishmaws and sharkfins are not available. India is, however, considered to be one of the major producers of sharkfins and fishmaws. Other important countries producing fishmaws are Malaysia, Pakistan, Thailand, Indonesia and Cambodia. Japan is the leading producer of sharkfins. Pakistan has recently emerged as one of the producers of this product.

In India the sharkfins and fishmaws industry has developed in the States of Tamil Nadu, Gujarat and Maharashtra and most of these are run on cottage industry basis.

Exports

Exports of sharkfins and fishmaws have increased considerably in recent years as these products are becoming popular in foreign markets. India, Pakistan and Malaysia are reported to be the principal exporters of fishmaws, while Japan is the largest supplier of sharkfins to the world market. Other important exporters of sharkfins are India and Pakistan. In recent years, Malaysia has also entered into the export trade of this item. In India, virtually the entire output of fishmaws and sharkfins is exported. In 1968-69 its exports were 4,156 tonnes. Singapore and Hong Kong have been the traditional markets for India's sharkfins and fishmaws. In recent years, UK has emerged as one of the major importers of these items. It has been noticed that there has been considerable rise in the unit value of this product. This is attributed to the recent shift in the direction of exports from the traditional markets to new markets like UK, which offer a higher unit value.

Prospects

The growing demand in overseas markets for sharkfins and fishmaws coupled with the anticipated increase in the landings of sharks and fishes like Indian salmon, jew fish etc. offers considerable scope for stepping up the export of these items from India.

An essential requirement for expanding the export trade in these items is to improve the quality of the product by adopting the latest methods of cutting, grading and packaging the fins. The practice of having a small margin of flesh when cutting the sharkfins for export should be given up, as the importers cut out the dried meat portion of the fins and decide the price on the basis of actual size. This inevitably results in a lower price than what is normally expected by the exporter. Additionally it causes some extra expense to the exporter for freight on the weight of the flesh which can be cut out before despatch. There is at present no proper grading of sharkfins by sizes with the result that fins of various sizes are mixed together. This affects price realisation. They should, therefore, be properly graded by size to realise a higher unit value. The products sometimes suffer loss in weight due to evaporation of moisture during the period of the voyage, as a result of which they frequently do not conform to the sample. Exporters should take note of this and ensure that the goods are properly packed in moisture proof polythene bags. Besides, it is necessary that the export should conform to the standards laid down by ISI and enforced by Export Inspection Council.

Sharkfin as such is only a raw material. The finished product which is used for making sharkfin soups is the translucent cartilagenous rods embedded in the fin. This finished product if attractively packed in airtight plastic bags, will find better demand in the overseas markets especially in Singapore and Hong Kong.

It is envisaged that if the above improvements are made, Indian sharkfins and fishmaws can, with some promotional effort be popularised in some of the countries in Asia and UK where these items are likely to fetch a good price. It is estimated that by 1973-74, 300 tonnes of these products (valued at Rs 4.60 million) could be exported and by 1978-79 an export trade of 400 tonnes could be developed to realise a foreign exchange earning of Rs 6.10 million. The market-wise export projections of these items are shown in table A-18.

Table A-18

Export Projections for Sharkfins and Fishmaws by Markets

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
Singapore	158	2.22	212	3.24
UK	64	0.92	100	1.28
Hong Kong	75	1.05	84	1.52
Others	3	0.41	4	0.06
Total	300	4.60	400	6.10

Sea Weeds

Seaweeds comprises two main varieties - the edible and the inedible. The former is one of the necessary and special items of food in Japan. It is also used as fodder and fertilizer. The latter is used for the extraction of agar agar and algin. The production of seaweeds is generally restricted to the relatively narrow littoral and sub-littoral belts of the marine environment.

Production

World production of seaweeds was 890,000 tonnes in 1968 as compared to 616,000 tonnes in 1961.

Japan is the largest producer of seaweeds with a production of 503,500 tonnes in 1968, accounting for 56.5 per cent of the world production. The other major producers are South Korea (119,500 tonnes), Norway (63,000 tonnes), USSR (60,900 tonnes), Canada (46,500 tonnes), Mexico (31,200 tonnes) and Argentina (24,800 tonnes).

Information regarding seaweed production in India is not available. It is, however, understood that there are several areas along the cost which offer suitable environment for a luxuriant growth of seaweeds of commercial value. Mandapam, Pamban, Rameshwaram, Keelakarai, Tuticorin, Kanya Kumari, Muttam and Colachel in Tamil Nadu, Visakhapatnam and its environs in Andhra Pradesh, Chilka lake in Orissa, Okha, Dwaraka and Veraval in Gujarat and Kovalam and Vizhingom in Kerala are some of the potential areas along the Indian cost for commercially valuable seaweeds. Laccadives, Andamans and Nicobar Islands are also noted their rich seaweeds.

Exports

Statistical information regarding world exports of seaweeds is not available. It is, however, reported that Japan is the major market for seaweed. Inspite of its huge production, Japan imports a sizeable quantity of seaweeds from various countries like South Korea, USSR, etc. A beginning was made by India in the export of this item in 1966-67 when it shipped 277 tonnes (valued at ₨ 803,000). Since then its exports have evinced a gradual decline. In 1967-68, they were of the order of 113 tonnes (valued at ₨ 145,000) in 1968-69. Lately the Government of India have placed a ban on the exports of seaweed in view of the internal demand for preparation of agar agar and other organic chemicals.

Japan is the only country which has been regularly taking some supplies of seaweeds from India since 1966-67, though on a diminishing scale. Spain and USA also figured for small quantities in 1966-67 and 1967-68 respectively.

Prospects

Despite the growing domestic demand for seaweeds in the agar-agar industry, there are certain other varieties of edible seaweeds (not used in the agar-agar industry) which can be readily marketed. In order to encourage the export of non-industrial seaweeds, it is suggested that the ban on such varieties of seaweeds as are not required for industrial uses may be lifted. It is understood that as a result of the ban, there has been a perceptible fall in the collection of seaweeds, particularly on the Mandapam and Rameshwaram coasts. The lifting of the ban as suggested above, would give a filip to the collection of seaweeds both for industrial and non-industrial uses. The former can be used for the industry and the latter utilised for export. Measures will also have to be taken for organising the collection of the seaweeds in a systematic manner.

Market studies reveal that there is a growing demand for seaweeds in the Japanese market, a part of which is at present met by imports from South Korea. It should not be difficult for Indian exporters of seaweeds to supply the Japanese market because of the high quality of the Indian product and competitive price.

PART-B

STRATEGY FOR DEVELOPMENT

Minimal exploratory studies reveal that Indian ocean replete with important commercial fisheries has a fishable potential of 8 million to 11.8 million tonnes. Besides, additional resource base around India's coastline is of the order of 2.9 million tonnes. Viewed against this background, India currently exploits only a small proportion of its fishery resources. Of its total marine fish landings of 933,000 tonnes in 1968 about three-quarters accrued from the west coast, largely from the in-shore belt. The east coast, although equally rich in commercial fisheries, remains vastly untapped. On account of inadequacy of large fishing vessels capable of undertaking wide range of operations, fishing in India at present is mainly restricted to in-shore belt upto 10 fms (fathoms). While fishing in off-shore areas (between 10 fms and 40 fms) has been inadequate it has been neglected to a great extent in deep sea and high sea regions (beyond 40 fms). In fact, unlike land-based industries fisheries beyond territorial waters being international in character, large fishing vessels of USSR, Japan, South Korea and other countries are exploiting the marine fishery wealth of the Indian Ocean, which otherwise, with proper infrastructural facilities, can be taken advantage of by the Indian fishing industry.

Despite this the Indian seafood industry has registered an impressive rise in exports during recent years (1961-68) growth rate being 14.3 per cent against the world growth rate of 8.2 per cent. Compared to the exports of marine products of Rs 39 million during 1961-62, in 1969 exports have been of the order of Rs 331 million. This is indicative of the fact that the present level of export performance can be improved upon substantially by systematic exploitation of the rich potential of the Indian seas. This, however, calls for a bold fishery development programme necessitating massive mobilisation of effort on several fronts:

a) Augmenting production from the off-shore and deep sea areas with the help of large vessels based on well-developed fishing harbours;

b) introduction of improved methods of fishing handling and fish processing, right from the landing centres through the processing units to the final point of shipment to ensure that the quality of the product conforms to the best international standards;

c) systematic development of export markets, both existing and new ones, by diversifying products as also by using improved techniques of marketing.

This part outlines the strategy and measures for mobilising the effort to accelerate the development of the industry at a faster pace and to meet the export targets envisaged by the Survey Team. It deals with the fishery development programme at selected centres on the east and west coasts of the country, investment outlays and financial assistance required, development of new product lines and the establishment of the Shrimp Export Development Authority.

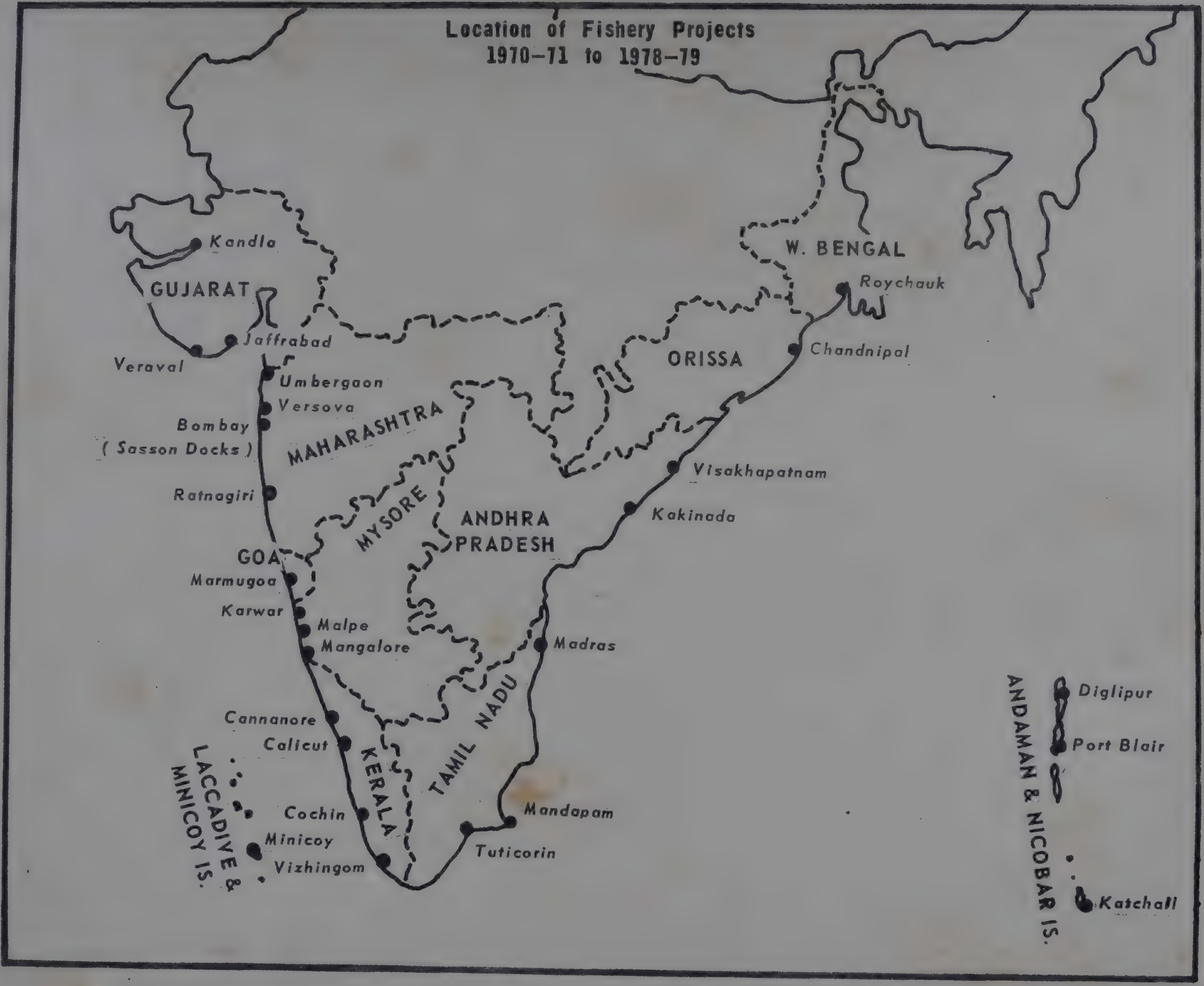
1.1 FISHERY DEVELOPMENT PROGRAMME

Fishery Projects

Based on the known and estimated potential of the country, a comprehensive and integrated programme for the development of major fisheries like shrimp, lobsters, sardines, mackerel, Bombay duck, eel and tuna capable of realising high unit value in the export market has been worked out for the Fourth and Fifth Plan periods. Taking into account the available species and the existing and planned infrastructural facilities, the Survey recommends 18 fishery projects and six processing units at 26 centres in the following maritime States and Union Territories.

Maritime State/Union Territory	Fishery Project Centres
Gujarat	(a) Kandla (b) Veraval (c) Jaffrabad
Maharashtra	(a) Sassoon Docks (Bombay) (b) Ratnagiri
Goa	(a) Marmugoa
Mysore	(a) Karwar (b) Malpe
Kerala	(a) Cochin (b) Vizhinjom
Laccadive Islands	(a) Minicoy

FISHERY DEVELOPMENT PROGRAMME



Location of Fishery Projects
1970-71 to 1978-79

GUJARAT
Kandla
Jaffrabad
Veraval
Umbergaon
Versova
Bombay
(Sasson Docks)
MAHARASHTRA
Ratnagiri
MYSORE
GOA
Marmugoa
Karwar
Malpe
Mangalore
Cannanore
Calicut
KERALA
Cochin
Minicoy
Vizhingom
LACCADIVE & MINICOY IS.
ANDHRA PRADESH
TAMIL NADU
Madras
Mandapam
Tuticorin
Kakinada
Visakhapatnam
ORISSA
Chandnipal
W. BENGAL
Roychauk
ANDAMAN & NICOBAR IS.
Diglipur
Port Blair
Katchall

Chart - 6

Tamil Nadu	(a) Tuticorin (b) Madras
Andhra Pradesh	(a) Kakinada (b) Visakhapatnam
Orissa	(a) Chandnipal
West Bengal	(a) Haldia
Andaman & Nicobar Islands	(a) Port Blair (b) Diglipur (c) Katchall
	Processing Centres
Gujarat	(a) Umbergaon (Mechanical Drying Unit)
Maharashtra	(a) Versova (Mechanical Drying Unit)
Mysore	(a) Mangalore (Fishmeal and Sardine Canning Plants)
Kerala	(a) Cannanore (Fishmeal Plant) (b) Calicut (Fishmeal and Canning Plants)
Tamil Nadu	(a) Mandapam (Freezing and Fishmeal Plants)

The structure of the fishery projects is based on the commercially viable model projects integrating all activities from fishing to marketing worked out for each region. While the overriding consideration in identifying the areas for fishery development and location of 18 composite fishery projects and 6 processing centres is the availability of fishery resources in each region, other governing principles include:

(a) fuller utilisation of the existing infrastructural facilities and the available processing capacity in various areas;

(b) intensive and extensive exploitation of known as well as new fishing grounds;

(c) diversification of products for processing and export;

(d) commercial profitability of the projects.

The fisheries recommended for fuller exploitation and export of various items after suitable processing include shrimp, sardines, lobster tails, mackerel, tuna, eel, frozen fish, Bombay duck, fishmeal and fish oil. The quantity and value of the exports of these products from different project centres by 1978-79 have been estimated by the Survey at 104,230 tonnes valued at Rs 822.61 million (Annexure B-1) and those from the six centres (Annexure B-2) where it is proposed to instal processing facilities at 10,950 tonnes (Rs 34.20 million). It has been estimated that annual exports of marine products by 1973-74 can be stepped upto 50,050 tonnes (Rs 609.43 million) as against the export of 30,810 tonnes (Rs 330.7 million) in 1969. By 1978-79 the annual estimated quantity available for export from these projects would be about 150,000 tonnes earning Rs 1,180.00 million in foreign exchange. The Survey has worked out the details of the estimated exports of marine products by the end of 1973-74 and 1978-79 (Annexure A-1) compared to the exports of 1968-69.

The fulfilment of the export target of Rs 1,180 million by 1978-79 will mainly depend upon deep sea fishing. This would necessitate substantial investment in fishing harbours, fishing vessels and processing equipment. The direct investment envisaged for various schemes by the Survey during the Fourth and Fifth Plan periods is indicated below:

Investment Pattern by 1978-79

(Rs million)

	1973-74		1978-79	Total
Fishing Harbours	225.22		210.20	435.42
Fishing Vessels	695.59	(60.12)	210.24	905.83
Processing Equipment	101.89	(34.48)	-	101.89
	1022.70	(94.60)	420.44	1443.14

(Figures in brackets indicate foreign exchange component involved)

Since the availability of good fishing harbours is an essential pre-requisite for the efficient operation of fishing vessels, a number of harbour development projects have been suggested elsewhere in the Report for completion in three phases at an estimated cost of Rs 435.42 million. Of this outlay Rs 225.22 million represents investment by 1973-74, Rs 104.20 million by 1975-76 and Rs 106 million by 1978-79. The cost of construction of these fishing harbours, being essentially of the nature of development expenditure for strengthening the base of the country's economy, has necessarily to be met by the Government of India, if necessary, with financial assistance from international agencies like the International Bank of Reconstruction & Development and the Asian Development Bank. The provision of ancillary facilities such as ice and cold storage, processing, transport, etc. will need to be provided by the State Governments/commercial agencies, fishing harbours being under the administrative control of the port authorities.

The project reports drawn up by the Survey suggest introduction of 3,162 small mechanised boats (11.1 m to 13.8 m) and 398 medium and large vessels (17.5 m to 27 m) at an estimated cost of Rs 905.83 million. The number of fishing vessels of various sizes needed for the proposed fishery projects by the end of 1978-79 together with estimated cost appear at Annexure B.3. The import of 60 out of 398 vessels involving about Rs 60.12 million has also been recommended in the initial two to three year period either directly or under joint venture programme. While the small boats suggested are largely for operation on the east coast and to some extent for replacement of obsolete boats by 1973-74, the introduction of 398 medium and large vessels need to be phased as follows:

Introduction of Medium & Large Vessels

Size of Vessel	1970-71 (No)	1971-72 (No)	1972-73 (No)	1973-74 (No)	1978-79 (No)
17.5 m (57 ft)	40	45	60	65	-
22 m (72 ft)	15*	20*	10*+5	10	25
27 m (88 ft)	5*	10*	20	25	43
Total	60	75	95	100	68

* Vessels to be imported

It has also been suggested that the large fishing trawlers built in the country should be subsidised by the Government of India and this would cost a sum of Rs 190.76 million in the Fourth and Fifth Plan periods. Besides subsidising the large fishing vessels, the amount involved in the duty-free supply of diesel oil to the fishing industry by the end of 1978-79 is of the order of Rs 87.55 million.

The cost of establishment of additional processing facilities in respect of these projects, taking into account the existing facilities and capacity has been worked out by the Survey at Rs 101.89 million which includes the foreign exchange component of Rs 34.48 million. The State-wise distribution and cost for the processing facilities to be provided by the end of 1978-79 as also the details of the foreign exchange requirements and earnings are indicated in Annexures B-4, B-5 & B-6.

A. FISHERY PROJECTS IN GUJARAT

Gujarat has a coastline of about 1,600 kms. Fishing in Gujarat has so far been confined to an average distance of 20 kms from the coast. Annual marine fish landings in the State are of the order of 86,000 tonnes. Of these, Bombay duck constitutes a major fishery contributing 51,000 tonnes. Pomfret is the second important fishery with an average contribution of

6,000 tonnes, followed by dara, ghol and miscellaneous varieties like eel, hilsa, clupeids, sciaenids and other species averaging about 4,000 to 5,000 tonnes each. Shrimp fishery has also attained importance in recent years.

Bombay duck, the major fishery is mainly dried and a very small percentage is utilised in the fresh form. Pomfret is largely consumed in frozen form and bulk of it is supplied to Bombay by carrier vessels. Of late, some quantity is despatched to Delhi and West Bengal by rail. There is as yet no processing plant in the State for either freezing whole fish or filleting and freezing pomfret which has a great potential in the export market. Shrimp is also caught in commercial quantities and in the case of this fishery also the advantage of its export potential has not yet been exploited.

The Bombay duck fishery in the State is centred around Jaffrabad and Umbergaon. Exports of this fishery have been only of the order of about 40 tonnes in 1967-68.

The present fish landings accrue from 3,281 indigenous non-mechanised crafts and about 1,700 small mechanised fishing boats averaging about 9-12 m in overall length. There are 46 fish landing centres in the State, important among them being Veraval, Jaffrabad, Umbergaon and Porbander. Veraval fishing harbour can accommodate vessels upto 16 ft. draft and has facilities of ice and cold storage plants, and for the repair and servicing. Ice and cold storage plants with facilities for landing of fish are also available at Porbander and Kandla. A small fish meal plant is currently operating at Jaffrabad.

Keeping in view the advantages offered by the free trade zone at Kandla, the fully equipped fishing harbour at Veraval and the landing facilities at Jaffrabad, fishery projects have been worked out for these three centres in Gujarat State. The essential features of the projects are outlined below.

Model Fishery Project

The Model Project envisages a complete unit consisting of a fleet for production of raw material, a processing unit for the freezing of shrimp and quality fish and having market arrangements for export and local sales. The fleet consists of 8 shrimp trawlers each 17.5 m in length with 200 BHP engines and 4 vessels of 22 m length with 350 BHP engines. While the 17.5 m vessel is expected to catch

500 kg of shrimp and 2,000 kg of fish per day, the 22 m vessel is likely to catch daily 700 kg of shrimp and 3,000 kg of fish. The average catch of shrimp per day from the fleet will be 6.8 tonnes and the fish landings will amount to 28 tonnes. Only 13 per cent of the 28 tonnes of fish landed will be quality fish which can be used for processing. The quality fish available for processing will thus be of the order of 3.64 tonnes daily and the important varieties will comprise pomfret, dara, ghol and perches. Details of capital investment on the fishing fleet, processing plant, operating cost and the expected returns from the fishery projects are shown below:

	Rs million
Capital Investment	
i) Fishing Vessels	
a) 8 shrimp trawlers of 17.5 m length with 200 BHP engines	6.00
b) 4 shrimp trawlers of 22 m length with 300/350 BHP engines	6.00
	12.00

ii) Processing Establishment	Nos	Cost (Rs)	Rs million
			2.35
Plate freezer	1	110,000	
IQF plant	1	500,000	
Four line graders	2	136,000	
Ice plant (20 tonnes)	1	300,000	
Equipment, utensils, etc.	-	100,000	
Ice storage (100 tonnes)	1)	200,000	
Chill storage (50 tonnes)	1)		
Frozen storage (100 tonnes)	1)		
Peeling sheds	2	50,000	
Water, power, sanitary fittings, standby power and buildings	-	300,000	
Refrigerated trucks	2	200,000	
Fish skinning machine	1	300,000	
Fish meal plant (2 tonnes), machinery and building	1	150,000	
Total capital investment			14.35

Landings

i) Shrimp	(Tonnes)
a) Catch of 8 vessels (17.5 m) @ 500 kg per vessel per day	4.0
b) Catch of 4 vessels (22 m) @ 700 kg per vessel per day	2.8
	6.8

ii) Fish	
a) Catch of 8 vessels (17.5 m) @ 500 kg per vessel per day	16.0
b) Catch of 4 vessels (22 m) @ 700 kg per vessel per day	12.0
	28.0

Operating Cost

i) Fishing Vessels

		Rs million
a)	Operating cost of 8 vessels (17.5 m) @ Rs 0.56 million per vessel	4.48
b)	Operating cost of 4 vessels (22 m) @ Rs 0.9 million per vessel	3.60
		8.08

ii) Processing Plants

		Rs million
a)	Cost of processing 680 tonnes of shrimp (50 per cent processed weight from annual landings) @ Rs 2,200 per tonne	1.50
b)	Cost of processing 364 tonnes of quality fish (13 per cent of annual fish landings) @ Rs 2,200 per tonne	0.80
c)	Cost of processing 50 tonnes of lobsters (50 per cent processed weight from annual landings) @ Rs 2,200 per tonne	0.11
d)	Cost of processing 88 tonnes of fish meal.(from 17 per cent of fish landings) @ Rs 100 per tonne	0.01
		2.42
	Total operating cost	10.50

		Rs million
Export Earnings		
i)	Export earnings from 680 tonnes of shrimp @ Rs 15,000 per tonne	10.20
ii)	Export earnings from 50 tonnes of frozen lobsters @ Rs 21,000 per tonne	1.05
iii)	Export earnings from 88 tonnes of fish meal @ Rs 1,000 per tonne	0.10
iv)	Export earnings from 364 tonnes of processed quality fish @ Rs 3,000 per tonne	1.09
		12.44
Local Sales		
	Sale of 3,920 tonnes fresh fish (70 per cent of the total fish landings for 200 days) @ Rs 100 per tonne	0.39
	Total earnings	12.83

a) Veraval Fishery Project

The type of fishing in Veraval will be the same as suggested in the Model Project with main concentration on shrimp trawling. Midwater trawls and utilisation of gillnets for pomfrets and other quality fish will also be adopted.

The fleet will consist of 400 small vessels ranging in size from 11.1 m to 13.8 m and 30 vessels of 17.5 m and above. The 30 large vessels can be operated by 5 fishing units (each unit comprising 4 vessels of 17.5 m and 2 vessels of 22 m) on commercially viable basis.

It is proposed to set up 3 processing units in this fishery project. Since each processing unit requires 2 fishing units, one of them will be left with only one fishing unit, as it is considered that it will be able to organise its raw material requirements from the small mechanised vessels operated by individuals/cooperatives.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 20 vessels of 17.5 m length with 200 BHP engines	15.00
b) Cost of 10 vessels of 22 m length with 300/350 BHP engines	15.00
c) Cost of 400 small trawlers (11.1 m and 13.8 m)	50.00
	80.00

	Rs million
ii) Processing Establishment	
Cost of 3 processing units @ Rs 2.35 million each	7.04
Total capital investment	87.04

Landings	(Tonnes)
i) Shrimp	
a) Present annual catch (70 per cent of the total in Gujarat) landed at Veraval	2,660
b) Additional annual catch (200 days) by 400 small boats and 30 large vessels	2,150
	4,810
ii) Fish	
a) Present fish landings excluding Bombay duck (30 per cent of the total landings in Gujarat) landed at Veraval	10,500
b) Additional landings of fish by 400 small and 20 large vessels	21,500
	32,000

		Rs million
Operating Cost		
i)	Fishing Vessels	
a)	Cost of operating 400 small boats (13.8 m and less) @ Rs 9,000 each	3.60
b)	Cost of operating 20 vessels (17.5 m) @ Rs 0.56 million each	11.20
c)	Cost of operating 10 vessels (22 m) @ Rs 0.9 million each	9.00
		23.80
ii)	Processing Plants	
a)	Cost of processing 2,400 tonnes of shrimp and lobsters (@ 50 per cent weight of landings) at Rs 2,200 per tonne in three units	5.28
b)	Cost of processing 2,080 tonnes of quality fish (13 per cent of the landings) @ Rs 2,200 per tonne in three units	4.58
c)	Cost of production of 400 tonnes of fish meal @ Rs 1,000 per tonne	0.40
		10.26
	Total operating cost	34.06

		Rs million
Export Earnings		
i)	Export earnings from 2,400 tonnes of processed shrimp @ Rs15,000 per tonne	36.00
ii)	Export earnings from 50 tonnes of frozen lobsters @ Rs 21,000 per tonne	1.05
iii)	Export earnings from 400 tonnes of fish meal @ Rs 1,100 per tonne	0.44
		37.49
Local Sales		
i)	Sale of 2,080 tonnes of fish locally @ Rs 3,000 per tonne	6.24
ii)	Local sale of 22,400 tonnes of fresh fish @ Rs 100 per tonne	2.24
		8.48
	Total earnings	45.97

b) Kandla Fishery Project

The necessity for the establishment of a fishery project at Kandla has long been felt in the Gulf of Kutch and North-West of Gulf. Since the current in the Gulf of Kutch at spring tides in certain months of the year exceeds five knots, the vessels proposed for the envisaged pilot project at Kandla must have higher horse power to overcome the effect of the currents while operating. The fleet will consist of four 22 m vessels with 350 BHP and 3 vessels of 27 m having 450 BHP. The average daily landings of shrimp and fish are estimated at 4.1 tonnes and 17 tonnes respectively. About 15 per cent of the 17 tonnes per day is expected to be quality fish and, therefore, can be processed in the form of whole frozen or filleted and frozen. The quantity of fish available for processing will be 2.55 tonnes per day. The following details relate to the capital investment on fishing fleet, processing plant, operating cost, export earnings and local sales.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 4 shrimp trawlers of 22 m length with 350 BHP @ Rs 1.5 million each	6.00
b) Cost of 3 shrimp trawlers of 27 m length with 450 BHP @ Rs 2.0 million each	6.00
	12.00

ii) Processing Establishment	Nos	Rs million
Plate freezers (2 tonnes)	1	0.11
Plant freezers (2 tonnes)	1	0.15
Ice plant (15 tonnes)	1	0.25
Ice storage (100 tonnes)	1	0.35
Chill storage (75 tonnes)	1	
Freezing storage (100 tonnes)	1	
Peeling shed	1	0.30
Building		0.12
Water, Power sanitary fittings and standby power		0.20
Refrigerated trucks	2	0.20
Fish skinning machine	1	0.50
Equipment for processing, utensils etc.		0.10
		2.48
Total capital investment		14.48

Landings

i) Shrimp

	(Tonnes)
a) Catch of 4 vessels (22 m) @ 500 kg per vessel per day	2.00
b) Catch of 3 vessels (27 m) @ 700 kg per vessel per day	2.10
	4.10

	(Tonnes)
ii) Fish	
a) Catch of 4 vessels (22 m) @ 2 tonnes per vessel per day	8.00
b) Catch of 3 vessels (27 m) @ 3 tonnes per vessel per day	9.00
	17.00

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 4 vessels (22 m) @ Rs 0.9 million each	3.6
b) Operating cost of 3 vessels (27 m) @ Rs 1.3 million each	3.9
	7.5
ii) Processing Plants	
a) Processing cost of 400 tonnes of shrimp (50 per cent weight of the total annual catch) @ Rs 2,200 per tonne	0.88
b) Processing cost of 250 tonnes of quality fish (15 per cent of the total annual catch) @ Rs 2,200 per tonne	0.55
c) Processing cost of 50 tonnes of lobsters (50 per cent weight of the lobster catch) @ Rs 2,200 per tonne	0.11
Total operating cost	9.04

		Rs million
Export Earnings		
i)	Export earnings from 400 tonnes of frozen shrimp @ Rs 15,000 per tonne	6.0
ii)	Export realisation from 250 tonnes of frozen fish fillets @ Rs 3,000 per tonne	0.75
iii)	Export earnings from 50 tonnes of lobsters @ Rs 21,000 per tonne	1.05
		7.80
Local Sales		
	Realisation from 1,400 tonnes of dried fish @ Rs 3,000 per tonne	4.20
	Total earnings	12.00

c) Jaffrabad Fishery Project

The total Bombay duck catch from Gujarat State is estimated at 40,000 tonnes per year. Out of this 60 per cent (24,000 tonnes) is expected to be landed at Jaffrabad port. Of this 30 per cent will be available for drying while 20 per cent will be sold locally in the frozen form. Thus the total quantity available for drying is estimated at 20,000 tonnes for 200 days of effective fishing which will be equivalent to 170 tonnes per day.

Drying Unit

Mechanical drying unit is proposed for handling the heavy landings of Bombay duck in Jaffrabad harbour. Each drying unit will consist of two tunnels, each having space for four trolleys (4' x 4' x 3'). Each trolley will have 4 partitions 1' apart. Each horizontal partition can take 16 rows with 16 Bombay ducks hung on each row. The four partitions can, therefore, handle at a time 1,000 Bombay ducks averaging a total weight of 150 kg. Each tunnel will handle 600 kg making the total in two tunnels to 1,200 kg. This would roughly process 2.5 tonnes on an average per day. Thus to handle 170 tonnes per day a total of 60 units will be required. Of these, only 40 units are suggested, which will work to full capacity during the season. Each drying unit is estimated to cost ₨ 50,000 and the total expenditure involved in the establishment of 40 units will be ₨ 2.00 million.

It is further estimated that 80 per cent of the Bombay duck available for drying can be converted into whole dried Bombay duck while the balance will be converted into laminated Bombay duck. The yield will be one-sixth in the former case while it will be one-eighth in the case of the laminated Bombay duck. Thus from the 100 tonnes of Bombay duck processed in a day, it is estimated that 13 tonnes of whole dried and 2.5 tonnes of laminated products will be available. Taking on an average 200 working days, the total production from these 40 units will work out to 2,600 tonnes of Bombay duck and 500 tonnes of laminated Bombay duck.

For proper storage of the dried material, it is proposed that the Jaffrabad harbour should have a 500 tonne cold-storage maintained at 40°C, at a total expenditure of Rs 500,000. Building, water and electricity connections for housing the drying units are estimated to cost additional sum of Rs 200,000 taking the total capital expenditure to Rs 700,000.

Regarding operational cost, expenditure for manning the smaller vessels is not being taken into consideration as these are operated by individuals. However, the cost of raw material purchased by the operators of the drying units within the harbour area is estimated at the wholesale price of Rs 500 per tonne which brings up the total cost of raw material to Rs 10.00 million. The cost of operation of the drying units for converting the raw material into the finished product is estimated at Rs 3.00 million in all. The total operating cost thus amounts to Rs 13.00 million.

It is expected that the entire quantity produced by the drying units can find an export market. The average export prices for whole dried Bombay duck and laminated Bombay duck are taken as Rs 4,000 and Rs 8,000 respectively per tonne. On this basis the total export earnings from 2,600 tonnes of Bombay duck and 500 tonnes of laminated Bombay duck will amount to Rs 14.40 million.

B. FISHERY PROJECTS IN MAHARASHTRA

Maharashtra with a coastline of 700 kms has a fleet of 7,894 indigenous fishing crafts and 2,440 small mechanised boats. This fleet lands on an average 128,000 tonnes of fish per annum.

The major landings of fish comprise non-penaeid prawns, about 40,000 tonnes, which are low unit value yielding items in the export trade, followed by Bombay duck averaging 27,000 tonnes. Other varieties of fish landed in commercial quantities and useful for processing are pomfret, dara, ghol, perches and eel.

Sassoon Docks is the main fish landing centre at the Bombay Port which is being developed into a full-fledged fishing harbour at an estimated cost of Rs 374 million. Versova is the second largest landing centre in the State catering mainly to carrier vessels operating from Gujarat. In the last two years, Ratnagiri has become prominent due to the location, and subsequent exploitation of rich shrimp fishery. In addition, the State has 14 fish landing centres capable of catering to small fishing crafts.

Majority of the processing plants in the State are located in Bombay and its suburban areas. Of late, the concentration of effort for shrimp fishing at Ratnagiri has encouraged the establishment of two plants with the possibility of a third one in the near future.

The export of frozen marine products from the State had been over Rs 20 million during 1968. In terms of quantity, it had been of the order of 1,560 tonnes, inclusive of 561 tonnes of dried fish. With a view to developing the fisheries and exports of fishery products, model project has been prepared as outlined below:

Model Fishery Project

In the model project for Maharashtra, the fleet will consist of 12 medium and large vessels - 8 vessels of 17.5 m length with 200 BHP engines and 4 vessels of 27 m fitted with 450 BHP engines. The shrimp catch for the 17.5 m vessel is estimated at 500 kg. and fish at 2,500 kgs per day. The 27 m vessel will land 700 kg of shrimp and 3,000 kgs of fish per day. The total landings per day of the fleet will therefore be 6.8 tonnes of shrimp and 32 tonnes of fish.

Of the total fish landed, 16.5 per cent will be available for freezing purposes after deducting the local supplies; and this accounts for 5.1 tonnes for freezing per day. From the shrimp catch, 80 per cent (5.6 tonnes) will be available for freezing and the remaining 1.4 tonnes will be available for canning. The yield from fish and shrimp is estimated to be 50 per cent, and as such, the total production from the model project per day will be 2.8 tonnes of finished shrimp, 2.5 tonnes of fish, and 4,600 cans of 4½ oz. drained shrimp meat. The can used is 8 oz round can 301 x 206. The output for canned shrimp has been worked out on the assumption that one pound meat requires three cans of the above size.

The fish catch will also consist of approximately 4 per cent of eel which can be used for preparation of smoked and canned eel products. It is estimated that 500 kg of eel meat will be available and this will produce 3,300 cans per day of the size of 4½ oz drained weight.

It is also estimated that 15 per cent of the fish catch will constitute miscellaneous varieties, which can be converted into fish meal. Thus, the total quantity available for conversion into fishmeal will be 4.8 tonnes per day and will yield 1 tonne of fishmeal per day.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 8 vessels of 17.5 m length with 200 BHP engines @ Rs 0.75 million each	6.00
b) Cost of 4 vessels of 27 m length with 450 BHP engines @ Rs 2.0 million each	8.00
	14.00

	Nos	Rs	Rs million
ii) Processing Establishment			
a) Freezing Unit	1		2.34
b) Canning Unit			0.16
Seamers	4	20,000	
Boiler	1	20,000	
Exhausters	2	10,000	
Balancers	4	8,000	
Retorts	4	6,000	
Brine Tanks	2	4,000	
Equipment and utensils of stainless steel		10,000	
Tables and accessories		50,000	
Buildings		10,000	
Cooling tanks and miscellaneous		10,000	
Laboratory equipment		10,000	
Smoke chamber		5,000	
		163,000	
			2.50
Total capital investment			16.50

	(Tonnes)
Landings	
i) Shrimp	
a) Catch of 8 vessels (17.5 m) @ 500 kg per vessel per day	4.0
b) Catch of 4 vessels (27 m) @ 700 kg per vessel per day	2.8
	6.8

		(Tonnes)
ii)	Fish	
a)	Catch of 8 vessels (17.5 m) @ 2.5 tonnes per vessel per day	20.0
b)	Catch of 4 vessels (17 m) @ 3 tonne per vessel per day	12.0
		32.0

Operating Cost		Rs million
i)	Fishing Vessels	
a)	Operating cost of 8 vessels of 17.5 m length with 200 BHP @ Rs 0.56 million per vessel	4.48
b)	Operating cost of 4 vessels of 27 m length with 450 BHP @ Rs 1.4 million per vessel	5.60
		10.08
ii)	Processing Plants	
a)	Charges for freezing 560 tonnes of shrimp (80 per cent of the annual shrimp landings) @ Rs 2,200 per tonne	1.23
b)	Charges for freezing 510 tonnes (16.5 per cent of the total annual landings) fish @ Rs 2,200 per tonne	1.12
c)	Charges for canning 920,000 cans of shrimp (20 per cent of the annual shrimp landings) @ Re 1 per can	0.92

		Rs million
d)	Charges for preparing 660,000 cans of eel (4 per cent of the total annual fish landings) @ Rs 1.25 per can	0.83
e)	Cost of production of 200 tonnes of fishmeal (15 per cent of the total fish landings) @ Rs 100 per tonne	0.02
		4.11
	Total operating cost	14.19

Export Earnings

i)	Export earnings from 560 tonnes of frozen shrimp @ Rs 15,000 per tonne	8.40
ii)	Export earnings from 30 tonnes of lobster @ Rs 21,000 per tonne	0.63
iii)	Export earnings from 700 tonnes of fishmeal @ Rs 1,100 per tonne	0.77
iv)	Export earnings from 920,000 cans of shrimp @ Rs 67.5 per can	2.58
v)	Export earnings from 660,000 cans of eel @ Rs 3 per can	1.98
		14.36

	₨ million
Local Sale	
i) Local sale of fresh fish (60 per cent of 22 tonnes per day) @ ₨ 200 per tonne	0.88
ii) Local sale of 500 tonnes of frozen fish @ ₨ 3,000 per tonne	1.50
	2.38
Total earnings	16.74

a) Sassoon Docks Fishery Project, Bombay.

The Sassoon Docks Fishery Project will consist of 250 small vessels of less than 15 m length and 65 medium and large vessels. The fleet of 65 vessels will consist of 44 numbers of 17.5 m length with 200 BHP, 14 numbers of 22 m with 350 BHP and 7 numbers of 27 m with 450 BHP. In working out the project, it is presumed that in addition to the catch brought in by the additional fleet, nearly 40 per cent of the total catch of shrimp will be landed at Sassoon Docks fishing harbour. This will amount to 3,160 tonnes to be fully utilised by the existing freezing and canning plants in Bombay. Similarly, 20 per cent of total fish landings in the Maharashtra State are expected to be landed at Sassoon Docks. Expected additional catch by the introduction of above fleet is estimated in the Sassoon Docks Fishery Project at 40,000 tonnes, of which 15 per cent will be accounted for by shrimp and 20 per cent by varieties of fish like pomfrets, dara, perches and eel which can be processed. Thus, the quantity of shrimp available at Sassoon Docks will be 6,000 tonnes for 200 days or an average of 20 to 30 tonnes per day; fish 6,000 tonnes for 200 days with an average of 30 to 40 tonnes per day. The total yield from the fleet will contribute 15 tonnes of shrimp and 20 tonnes of fish per day.

To handle the available quantity, 6 composite units are proposed, each handling 2.5 tonnes of shrimp and 32 tonnes of fish per day. Besides, a fishmeal plant capable of handling 10 tonnes of raw material per day will also be established to handle 5 per cent of miscellaneous fish that may be available from the total fish of 40,000 tonnes. The yield from the fishmeal plant will be 1.75 tonnes of finished product per day or 250 tonnes per year, considering that the plant will be operating on an average for 200 days in a year. Eel for canning (3 per cent of the total catch) will amount to 1,200 tonnes per year or 6 tonnes per day.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 44 vessels of 17.5 m length with 200 BHP engine @ Rs 750,000 per vessel	33.00
b) Cost of 14 vessels of 22 m length with 450 BHP engine @ Rs 1.5 million per vessel	21.00
c) Cost of 7 vessels of 27 m length with 450 BHP engine @ Rs 2.0 million per vessel	14.00
d) Cost of 250 small vessels @ Rs 125,000 per vessel (less than 15 m length)	31.25
	99.25
ii) Processing Establishment	
a) Freezing and canning units as in the Model Project (6 units @ Rs 2.5 million each)	15.00
b) Frozen storage at wharf (500 tonnes capacity)	0.80
Total capital investment	114.25

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Cost of operation of 44 vessels (17.5 m) @ Rs 560,000 per vessel	24.64
b) Cost of operation of 14 vessels (22 m) @ Rs 960,000 per vessel	13.44
c) Cost of operation of 7 vessels (27 m) @ Rs 1.36 million per vessel	9.52
	47.60
ii) Processing Plants	
a) Processing cost of 3,000 tonnes of shrimp @ Rs 2,200 per tonne	6.60
b) Processing cost of 4,000 tonnes of fish @ Rs 2,200 per tonne	8.80
c) Processing cost of 250 tonnes of fishmeal @ Rs 100 per tonne	0.03
d) Processing cost of 4,360,000 cans of eel @ Rs 1.25 per can	5.45
	20.88
Total operating cost	68.48

		Rs million
Export Earnings		
i)	Exports of 3,000 tonnes of processed shrimp @ Rs 15,000 per tonne	45.00
ii)	Export of 50 tonnes of frozen lobsters @ Rs 21,000 per tonne	1.05
iii)	Export of 4.36 million cans of eel @ Rs 3 per can	13.08
iv)	Export of 250 tonnes of fishmeal @ Rs 1,100 per tonne	0.28
		59.41
Local Sale		
i)	Local sale of 20,000 tonnes of fish @ Rs 200 per tonne	4.00
ii)	Sale of 4,000 tonnes of frozen fish @ Rs 3,000 per tonne	12.00
		16.00
	Total Earnings	75.41

b) Ratnagiri Fishery Project

In the Ratnagiri Project 240 small fishing vessels of less than 15 m length have been provided. Additional catch from these vessels is expected to be of the order of 15,000 tonnes, of which 15 per cent is estimated to be shrimp. Over and above the additional catch, nearly 40 per cent of the shrimp along the Maharashtra Coast is expected to be landed at Ratnagiri (this amounts to 3.150 tonnes). Therefore, the total shrimp landings in Ratnagiri will be 3,150 as existing catch and additional catch at 15 per cent of 15,000 tonnes (2,250 tonnes), making a total of 5,400 tonnes for 200 days of operation. This is equivalent to 27 tonnes per day capable of yielding 13.5 tonnes of processed product.

Ratnagiri has already two freezing plants with 10 tonnes capacity each. As the total quantity of shrimp to be handled is only 13.5 tonnes, there is no further scope for expansion of freezing units in the area. Similarly as varieties of fish for filleting are not available in the area, fish freezing unit also is at present not included. Thus capital investment in this area is only for 240 small vessels at the rate of Rs 125,000 per boat giving a total of Rs 30 million. The operational cost includes:

		Rs million
i)	Cost of 2,250 tonnes of shrimp (landed by 240 trawlers) @ Rs 4,000 per tonne	9.00
ii)	Processing cost of 1,125 tonnes of processed product @ Rs 2,250 per tonne	2.53
	Total operating cost	11.53

The additional revenue by way of export of 1,125 tonnes of frozen shrimp @ Rs 15,000 per tonne is estimated at Rs 16.88 million and 50 tonnes of lobster valued at Rs 1.05 million. Besides, a small portion of varieties of fish which cannot be processed could be sold in the local market in fresh form. This is estimated to yield an additional revenue of Rs 1.05 million, raising the total earnings to Rs 18.93 million.

c) Versova Mechanical Drying Unit

It is expected that 10,000 tonnes of Bombay duck will be available for mechanical drying both as laminated and ordinary Bombay duck resulting in an improved hygienic product, a valuable foreign exchange earner. A mechanical means of drying is proposed for handling the Bombay Duck at Versova. The quantity expected per day will be about 50 tonnes for about 200 days in a year. Each drying unit will consist of two drying tunnels with heated air under forced draft being circulated through each. Four trolleys will handle 150 kgs in 8 hours. Assuming two-shift operation about 2.05 tonnes can be processed daily. To handle 50 tonnes per day a total of 20 units will be necessary. The estimated cost of a drying unit is about Rs 50,000 and the total expenditure is likely to be

₨ 1.00 million. Of the total, 80 per cent of the Bombay duck will be the ordinary "round dried" and the balance 20 per cent will be of the laminated type.

To enable the finished product to fetch better unit value a cold storage of 250 tonnes capacity for the dried Bombay duck is proposed at Versova, the temperature to be maintained in the storage being 40°C. The cost of the building, water and electricity will be about ₨ 400,000. The cost of the raw material is estimated at ₨ 500 per tonne, the total cost being ₨ 5.00 million. The cost of operation of the drying units is estimated at ₨ 1.5 million. Total operating cost including raw materials will be ₨ 6.5 million. An export price averaging ₨ 4,000 per tonne will realise ₨ 5.2 million from the ordinary Bombay duck (1,300 tonnes) and ₨ 2.00 million from the laminated Bombay duck (250 tonnes at ₨ 8,000 per tonne). Total returns are, therefore, expected to be of the order of ₨ 7.2 million.

C) FISHERY PROJECT IN GOA

Goa has a coastline of about 100 kms, which is rich in fishery resources and large shoals of mackerel and sardines appear during the fishing season between October and March, yielding abundant catches. Total annual yield of fish in Goa is about 19,000 tonnes which includes approximately 4,000 tonnes of mackerel, 3,000 tonnes of sardine, 900 tonnes of shrimp and 1,000 tonnes of anchovies. In addition to these varieties, other important varieties of fish available in this region are Indian salmon, pomfret, Bombay duck, sharks, rays and jew fish. At present there are 4 canning units in Goa engaged in processing mackerel, sardine, Indian salmon, tuna and shrimp. These plants annually process about 400 tonnes of marine products. As the demand for fresh fish is on the increase, the plants do not get enough raw material for utilising their full capacity. Goa has also at present three freezing plants in the private sector in addition to the plant with a total freezing capacity of 400 tonnes per year maintained by the Department of Fisheries. The fishing fleet in this region consists of over 1,000 non-mechanised boats and 90 mechanised boats. Major fish landing centres are Marmugoa and Panaji, of which Marmugoa is the most important.

The Fourth Plan provides an additional fleet of 75 small vessels of less than 15 m length for the Goa region. With this the total catch is expected to go up to 23,000 tonnes by the end of 1973-74. The increased catch of nearly 4,000 tonnes annually is expected to include

10 per cent shrimp (400 tonnes), about 600 tonnes of sardine and 800 tonnes of mackerel. As the existing capacity of freezing plants will not be sufficient to handle the total of 1,300 tonnes of shrimp, it is proposed that the capacity of each of these plants is increased to 5 tonnes per day. This can be achieved by adding one plate freezer to each of the units and also by increasing the frozen storage capacity proportionately. As only 25 tonnes of ice per day is available in the Goa region, it is also proposed that an additional 25-tonne unit may be established for production of ice. Therefore capital investment involved in the shore establishment as well as fishing fleet will be as follows:

Capital Investment	Rs million
i) 75 fishing vessels (11.1 m) @ Rs 120,000 per vessel	9.00
ii) Processing Establishment:	
Two plate freezers	0.22
Cold storage plants	0.40
Ice plant (25 tonnes) and ice storage (100 tonnes)	0.35
Frozen storage at the wharf (100 tonnes)	0.30
Total capital investment	10.27

		Rs million
Operating Cost		
i)	Cost of 200 tonnes of shrimp meat @ Rs 6,000 per tonne	1.20
ii)	Cost of 600 tonnes of sardine @ Rs 200 per tonne	0.12
iii)	Processing cost of 200 tonnes of frozen shrimp @ Rs 2,200 per tonne	0.44
iv)	Processing cost of 1.98 million sardine cans (from 600 tonnes sardine) @ 50 paise per can	0.99
	Total operating cost	2.75
Export Earnings		
i)	Export earnings from 200 tonnes of frozen shrimp @ Rs 15,000 per tonne	3.00
ii)	Export earnings from 1.98 million sardine cans @ 75 paise per can	1.48
	Total export earnings	4.48

D. FISHERY PROJECTS IN MYSORE

Mysore with a coastline of 300 kms has been contributing on an average 60,000 tonnes of catch per year. The fish landings on an average comprise 29,000 tonnes of oil sardines, 11,000 tonnes of mackerel, 2,000 tonnes of prawns, and 1,000 tonnes of pomfrets. The State has a fishing fleet of 6,357 indigenous crafts, mostly dug-out canoes and 556 specially designed small mechanised trawlers averaging 9 m in length. A large proportion of landings of sardines and mackerel is effected by shore-seines.

Major landing centres in the State are Karwar, Malpe, Mangalore, Bhatkal and Coondapur. Karwar fishing harbour project has almost been completed and Mangalore and Malpe harbour projects are included in the Fourth Plan schemes.

Mangalore and Malpe are the only two places which have developed freezing units. Malpe also has one unit each for canning and fish meal production. A small freezing plant has been established at Karwar under the Indo-Norwegian Project.

The quantity of processed marine products in the State is of the order of about 1,000 tonnes per annum. The total exports of frozen and canned shrimp from the State in 1968 were 900 tonnes valued at Rs 10 million. Mostly the processing activities in the State relate to shrimp freezing although Malpe plant produces a small proportion of canned sardines and mackerel for local consumption. A good proportion of shrimp landings in the State still find their way to freezing and canning factories in Kerala. It is against this background that the fishery projects outlined below are drawn up for the fishing harbours in Karwar and Malpe.

Model Fishery Project

The major fisheries available in Mysore coast are shrimp, mackerel and sardines. Fishing vessels introduced in this area, therefore, are capable of trawling and purse-seining. For a Model Project, 8 vessels have been recommended - five numbers of 13.8 m and three of 17.5 m in length.

It is expected that a 13.8 m vessel will land about 400 kgs of shrimp per day and 1,000 kg of fish while the 17.5 m vessel will land approximately 500 kg of shrimp and two tonnes of fish per day. Thus from the eight vessels, a total of 700 tonnes of shrimp and 2,200 tonnes of fish are expected to be landed on an average for 200 days of operation. From the total fish catch, on an average 40 per cent will be accounted for by sardine (880 tonnes) about 20 per cent by mackerel (440 tonnes) and 40 per cent by other miscellaneous varieties of fish.

The processing unit to be established under the model project will thus have to handle 3.5 tonnes of shrimp, 4.4 tonnes of sardines, 2.2 tonnes of mackerel and 1.65 tonnes of miscellaneous fish, yielding processed products as follows:

i)	Shrimp	-	1.75 tonnes per day
ii)	Sardine	-	17,360 quarter dingley cans per day
iii)	Mackerel	-	3,630 A/1 tall cans per day
iv)	Fishmeal	-	330 kgs per day

Freezing plant to process 1.75 tonnes of finished product per day should have a minimum capacity of 5 tonnes.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) 5 vessels of 13.8 m length @ Rs 0.23 million per vessel	1.15
b) 3 vessels of 17.5 m length @ Rs 0.75 million each	2.25
c) Purse-seining gear	0.30
	3.70

ii) Processing Establishment

a) Freezing

	Rs million
Peeling shed	0.10
Plate freezers (two numbers)	0.22
I.Q.F. Plant	0.50
Ice plant (10 tonnes capacity)	0.20
Ice storage (50 tonnes) and chill storage (50 tonnes)	0.15
Frozen storage (50 tonnes)	0.15
Grader	0.30
Refrigerated truck	0.10
Building and equipment	0.18
	1.90

b) Canning

	Rs million
Irregular seamer (one number)	0.015
MB 1A seamer (two numbers)	0.010
Exhaust pipes (two numbers)	0.01
Retorts (three numbers)	0.01
Brining tank, oil tank (stainless steel)	0.01
Building and other accessories	0.10
Overhead tank	0.025
Boiler	0.02
Water and electric connections	0.025
	0.225

c) Fishmeal

	Rs million
Plant and building	0.12
Total capital investment	5.95

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Cost of operation of 5 vessels (13.8 m) @ Rs 0.27 million each	1.35
b) Cost of operation of 3 vessels (17.5 m) @ Rs 0.56 million per vessel	1.68
ii) Processing Plants	
a) Cost of processing 350 tonnes of shrimp @ Rs 2,200 per tonne	0.77
b) Cost of production of 3.47 million sardine cans @ paise 50 per can	1.74
c) Cost of production of 726,000 cans of mackerel @ Re 1 per can	0.73
d) Cost of production of 66 tonnes of fishmeal @ Rs 100 per tonne	0.01
Total operating cost	6.28
Export Earnings	
i) Export earnings from 350 tonnes of shrimp @ Rs 10,000 per tonne	3.50
ii) Export earning from 3.5 million cans of sardine @ paise 75 per can	2.60

		Rs million
iii)	Export earnings from 726,000 cans of mackerel @ Rs 1.50 per can	1.09
iv)	Export earnings from 66 tonnes of fishmeal @ Rs 1,100 per tonne	0.07
Local Sales		
	Local sale of 550 tonnes of fresh fish @ Rs 100 per tonne	0.06
	Total earnings	7.32

a) Karwar Fishery Project

In the Karwar Project, 35 small boats and 15 medium vessels have been provided. The small vessels will be of 11.3 m in length. The medium size vessels will consist of 9 numbers of 13.8 m and 6 numbers of 17.5 m length. The total additional catch from these vessels is expected to be 9,000 tonnes a year. Of this 15 per cent will be shrimp, 40 per cent sardines, 20 per cent mackerel and the rest miscellaneous varieties of fish. Thus, the quantities available for processing in the Project will be:

Shrimp :	1,350 tonnes
Sardine :	3,600 tonnes
Mackerel :	1,018 tonnes
Miscellaneous varieties of fish :	3,600 tonnes

These will give a daily out-turn of 6.7 tonnes of shrimp, 10 tonnes of sardine, 9 tonnes of mackerel and 18 tonnes of miscellaneous fish. The yield from shrimp is taken to be 40 per cent.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) 35 small vessels (11.3 m) @ Rs 0.12 million each	4.20
b) 9 vessels (13.8 m) @ Rs 0.225 million each	2.03
c) 6 vessels (17.5 m) @ Rs 0.75 million each	4.50
	10.73
ii) Processing Establishment	
Freezing Unit (one - as in Model Project)	1.22
Canning Units (two numbers)	0.45
Fishmeal Plant	0.35
	2.02
Total capital investment	12.75

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 9 vessels (13.8 m) @ Rs 0.27 million each	2.43
b) Operating cost of 6 vessels (17.5 m) @ Rs 0.56 million each	3.36
	5.79
ii) Processing Plants	
a) Cost of processing 540 tonnes of shrimp @ Rs 2,200 per tonne	1.19
b) Cost of production of 15 million sardine cans @ 50 paise per can	7.50
c) Cost of production of 2.88 million cans of mackerel @ Re 1 per can	2.88
d) Cost of production of 260 tonnes of fishmeal @ Rs 100 per tonne	0.026
Total operating cost	17.39
Export Earnings	
i) Export earnings from 540 tonnes of processed shrimp @ Rs 10,000 per tonne	5.40
ii) Export earnings from 15 million cans of sardine @ 75 paise per can	11.25

		Rs million
iii)	Export earnings from 2.88 million cans of mackerel @ Rs 1.50 per can	4.32
iv)	Export earnings from 260 tonnes of fishmeal @ Rs 1,100 per tonne	0.29
		21.26
Local Sales		
	Sale of 2,250 tonnes of fresh fish @ Rs 100 per tonne	0.23
	Total earnings	21.49

b) Malpe Fishery Project

The type of fishing in Malpe Fishery Project will be similar to that in Karwar Project. There will be 150 vessels of 11.3 m length, 18 vessels of 13.8 m length and 12 vessels of 17.5 m length.

The processing complex at Malpe includes two freezing units of 5 tonne capacity each, 4 canning units each with a capacity of 30,000 cans per day and one fishmeal plant of one tonne finished product.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) 150 vessels of 11.3 m length @ Rs 0.12 million each	18.00
b) 18 vessels of 13.8 m length @ Rs 0.225 million each	4.05
c) 12 vessels of 17.5 m length @ Rs 0.75 million each	9.00
d) Purse-seine gear	0.80
	31.85
ii) Processing Establishment	
Two freezing units of 5 tonne capacity each Four canning units each with 30,000 cans per day capacity One fishmeal plant	4.04
Total capital investment	35.89
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 18 vessels (13.8 m) @ Rs 0.27 million each	4.86
b) Operating cost of 12 vessels (17.5 m) @ Rs 0.56 million each	6.72
ii) Processing Plants	23.20
Total operating cost	34.78

Earnings	Rs million
i) Export earnings	41.41
ii) Local sales from fresh fish	0.45
Total earnings	41.86

E. FISHERY PROJECTS IN KERALA

Kerala State, with a coastline of about 600 kms and continental shelf of 25,090 sq. km is responsible for the production of about 350,000 tonnes of marine fish annually which forms 33 per cent of the total marine fish landings in the country. The State is rich in several varieties of fish like oil sardines, prawns, mackerel, soles and seer fish. Marine fish landings in the State in 1968 were of the order of 345,000 tonnes. Of this, oil sardines at 247,000 tonnes and penaeid prawns at 25,000 tonnes represented 71.4 per cent and 7.1 per cent respectively. The State tops the list in the penaeid prawn landings, which form about 70 per cent of the total landings of this species in the country.

At present more than 1,200 mechanised boats and 21,000 small boats of catamaran and dugout types are in operation in the Kerala Coast. All the mechanised boats with the exception of a few are of small sizes ranging from 8.3 m to 12.3 m in length. There are only about 12 boats which are of the size of 15.1 m and above. The small mechanised boats which form major portion of the fishing fleet in the State operate mainly in the in-shore area upto 15 fathoms on account of their limited range of operation.

The State has the lead in the field of fish processing and export, particularly in the exports of frozen and canned shrimp. There are at present 25 freezing and 18 canning units with an annual processing capacity of about 40,000 tonnes and 9,000 tonnes respectively, distributed from Trivandrum in the south to Cannanore in the north. Of the total marine products export of about Rs 246 million in 1968-69 from India, Kerala alone contributed about 85 per cent.

Only to a limited extent landing and berthing facilities for fishing vessels are at present available in Cochin, Alleppey, Neendakara, Beypore, Cannanore and

Balipatnam. In view of the importance of the fisheries to the economy of the State and the rapid expansion in the field of fishing and fish processing, Kerala has envisaged and put into operation plans for development of fishing harbours at Vizhinjom, Cochin, Beypore, Cannanore and a few other places. The speedy development of these harbours becomes more important in the light of the need for the proposed expansion of the fishing fleet during the Fourth Plan period.

A study of the fishery and fishing industry of the Kerala coast indicates that uptill now fishing activity has been restricted mainly to in-shore areas, while the off-shore regions which have been proved to be highly productive by exploratory fishing trials and limited commercial operations, remain yet untapped. It is against this background that model fishery project as well as the fishery projects outlined below have been drawn up in order that the balanced exploration of both in shore and off-shore waters of the coastal area is made feasible.

Model Fishery Project

In working out a model project for Kerala, the diversified nature of fishery off the Kerala coast has been taken into consideration. The fishery in the northern sector is dominated by sardine, mackerel and shrimp while in the central sector shrimp constitutes the major catch followed by deep-sea prawn, sardine, mackerel, bonito and tuna. The southern sector on the other hand is characterised by its lobster fishery, both rock lobster and deep-sea lobster, shrimp, seer and tuna. This sector also has potentialities of having commercial varieties of fish for processing like perch and breams from the Wadge Bank. The fleet recommended for the Kerala sector therefore consists of vessels capable of fishing all these varieties. A total of eight vessels are being recommended to form the fishing fleet, three of 17.5 m, two of 22 m and three of 27 m size. Two of the 27 m vessels will do combination fishing for fish, deep-sea prawn, lobster, sardine and mackerel, while the third will do long-lining for tuna and trawling for fish.

The 17.5 m vessels are expected to land 500 kg of shrimp and 2 tonnes of fish per vessel per day making the total catch for this type of vessel at 1.5 tonnes of shrimp and 6 tonnes of fish per day. With the 22 m vessel, 700 kg of shrimp and 3 tonnes of fish are expected per vessel per day making the total at 1.4 tonnes of shrimps and 6 tonnes of fish per day. The two vessels of 27 m which will carry out fishing for sardines, mackerel, lobsters, etc. are expected to land 20 tonnes of sardines, 10 tonnes of mackerel, 4 tonnes of deep sea lobsters and 2 tonnes of deep-sea prawn. The third 27 m vessel is expected to land on an average 1 tonne of tuna, while the three vessels together will land about 12 tonnes of quality fish per day. Sardine, mackerel and tuna in in-shore areas being seasonal fishery, only 80 days fishing is contemplated while deep-sea lobster and deep-sea prawn are expected to be available for 120 days in a year. Thus the total quantity of the various types of fish available for processing in the model project per day is as follows:

i) Shrimp - 2.9 tonnes per day (yield @ 40 per cent = 1.16 tonnes)

ii) Deep sea prawn - 2 tonnes per day (yield @ 30 per cent = 0.6 tonne)

iii) Deep-sea lobster - 4 tonnes per day (yield @ 25 per cent = 1 tonne)

iv) Fish for filleting - 12 tonnes per day (yield @ 50 per cent = 6 tonnes)

v) Sardines - 20 tonnes per day (75,000 quarter dingley cans)

vi) Mackerel - 10 tonnes per day (17,000 A1 tall cans)

vii) Tuna - 1 tonne per day (3,000 cans of 8 oz. fluid capacity)

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of three vessels of 17.5 m @ Rs 0.75 million each	2.25
b) Cost of two vessels of 21.5 m @ Rs 1.5 million each	3.00
c) Cost of three vessels of 27 m @ Rs 2 million each	6.00
	11.25
ii) Processing Establishment	
a) Freezing Unit	
One Plate freezer	0.11
One Blast freezer	0.30
Ice plant (25 tonnes) and Ice storage (100 tonnes)	0.359
Skinning Machine	0.30
Grading Machine	0.136
Chill storage (50 tonnes)	0.20
Frozen storage (100 tonnes)	
One Peeling shed	0.02
Equipments, utensils, etc.	0.20
One Refrigerated truck	0.10
Building	0.15
	1.87
b) Canning Unit	
Irregular seamers - 2	0.03
Angles seamer	0.02
Six retorts	0.02
Three exhaust boxes	0.02
Stainless steel accessories	0.20
Building	0.15
Overhead tanks, water and power connections	0.10
	0.54
Total capital investment	13.66

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Cost of operating 3 vessels (17.5 m) @ Rs 0.56 million each	1.68
b) Cost of operating 2 vessels (22 m) @ Rs 0.96 million each	1.92
c) Cost of operating 3 vessels (27 m) @ Rs 1.36 million each	4.08
	7.68
ii) Processing Plant	
a) Freezing	
Processing cost of 352 tonnes of frozen shrimp @ Rs 2,200 per tonne	0.771
Processing cost of 1,400 tonnes of frozen fish @ Rs 2,000 per tonne	2.80
b) Canning	
Cost of processing 6 million cans of sardine @ 0.50 paise per can	3.00
Cost of production of 1.36 million cans of mackerel @ Re 1 per can	1.36
Cost of producing 600,000 cans of tuna @ Re 1 per can	0.60
	8.52
Total operating cost	16.21

		Rs million
Export Earnings		
i)	Export earnings from 352 tonnes of frozen shrimp @ Rs 10,000 per tonne	3.52
ii)	Export earnings from 1,400 tonnes of frozen fish @ Rs 3,000 per tonne	4.20
iii)	Export earnings from 6 million cans of sardine @ 75 paise per can	4.50
iv)	Export earnings from 1.36 million cans of mackerel @ Rs 1.50 per can	2.04
v)	Export earnings from 600,000 cans of tuna @ Rs 2 per can	1.20
vi)	Export earnings from 120 tonnes of frozen lobsters @ Rs 10,000 per tonne	1.92
Local Sales		
	Local sale of 2,400 tonnes of fresh fish @ Rs 100 per tonne	0.24
	Total earnings	17.62

a) Cochin Fishery Project

In the Cochin fishery project 55 additional large vessels have been provided. Based on the model project for Kerala, these vessels will be divided into the following categories:

i) 21 vessels of 17 m with 200 BHP
ii) 14 vessels of 22 m with 300 BHP
iii) 20 vessels of 27 m with 450 BHP

The total additional fish catch from these vessels has been estimated at 60,000 tonnes per year in this project. Its composition is likely to be as follows:

Shrimp (20 per cent)	12,000 tonnes
Deep-sea lobster (2 per cent)	1,200 "
Deep-sea prawn (4 per cent)	2,400 "

Thus the total quantity available for freezing works out to 15,600 tonnes of different types of shrimp and lobsters which will yield 5,800 tonnes of finished product. However, existing freezing capacity in Cochin is estimated to be over 40,000 tonnes of which only about 10,000 tonnes is at present utilised. Hence, the entire additional catch of shrimp and lobsters from the fleet recommended for the project can be utilised by the existing plants. No additional freezing units are therefore included for the Cochin project.

Cochin being in the sardine and mackerel zone, about 4,500 tonnes of sardine and 2,500 tonnes of mackerel are expected to be landed in a month on an average for three months per year. The average availability has been taken at 140 tonnes of sardine and 70 tonnes of mackerel for 80 days in a year. The existing canning plants can additionally handle 2,400 tonnes of sardine, as only 22 per cent of the canning capacity is at present normally utilised in the area. This leaves 8,800 tonnes of sardine, 5,600 tonnes of mackerel and 1,200 tonnes of bonito and tuna to be processed. This works out to nearly 110 tonnes of sardine, 70 tonnes of mackerel and 6 tonnes of tuna for daily processing.

A fishmeal plant of 50 tonnes capacity is envisaged in the project area which will handle 50 out of the 110 tonnes of sardine; assuming that 50 per cent of the remaining sardines and mackerel will be utilised in the fresh fish markets. Only 30 tonnes of sardine and 35 tonnes of mackerel will be used for canning per day besides tuna. This requires the establishment of three canning units as envisaged in the model project.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 21 vessels of 17.5 m @ Rs 0.75 million each	15.75
b) Cost of 14 vessels of 22 m @ Rs 1.5 million each	21.00
c) Cost of 20 vessels of 27 m @ Rs 2.0 million each	40.00
	76.75

	Rs million
ii) Processing Establishment	
a) Fishmeal plant	2.50
b) Canning units (three numbers)	1.35
c) Master ice plant (200 tonnes capacity)	2.50
d) Central ice storage and chill storage (500 tonnes capacity each)	0.80
e) Frozen storage at wharf* (100 tonnes capacity)	1.50
	8.65
Total capital investment	85.40

Operating Cost

	Rs million
i) Fishing Vessel	
a) Cost of operating 21 vessels (17.5 m) @ Rs 0.56 million each	11.76
b) Cost of operating 14 vessels (22 m) @ Rs 0.96 million each	13.44
c) Cost of operating 21 vessels of 27 m @ Rs 1.36 million each	28.56
	53.76

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* To serve as a bonded warehouse and put up by an appropriate authority, preferably the port.

		Rs million
ii)	Processing Plant	
a)	Processing cost of 5,520 tonnes of shrimp @ Rs 2,200 per tonne	12.14
b)	Processing cost of 300 tonnes of lobsters @ Rs 1,000 per tonne	0.30
c)	Production cost of 27 million cans of sardine @ 50 paise each	13.50
d)	Production cost of 9.5 million cans of mackerel @ Re 1 each	9.50
e)	Production cost of 3,600,000 tuna cans @ Re 1 each	3.60
f)	Production cost of 1,600 tonnes of fishmeal @ Rs 100 per tonne	0.16
	Total operating cost	92.96

Export Earnings

i)	Export earnings from 5,520 tonnes of shrimp @ Rs 10,000* per tonne	55.20
ii)	Export earnings from 300 tonnes of lobsters @ Rs 16,000** per tonne	4.80
iii)	Export earnings from 27.0 million cans of sardine @ 75 paise per can	20.25
iv)	Export earnings from 9.5 million cans of mackerel @ Rs 1.50 per can	14.25

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* Price for frozen shrimp has been taken at Rs 10,000 per tonne as the major portion of shrimp handled in this area belongs to smaller size grades - mainly 91-110, 111-130 and 130 up per pound.

** Deep sea lobster has been priced only at 50 per cent of the normal price for spiny lobster.

		Rs million
v)	Export earnings from 3.6 million cans of tuna @ Rs 2 per can	7.20
vi)	Export earnings from 1,600 tonnes of fishmeal @ Rs 800 per tonne	1.28
vii)	Export earnings from 800 tonnes of fish oil @ Rs 1,200 per tonne	0.96
	Total export earnings	103.94

b) Vizhinjom Fishery Project

Fifty medium and large vessels have been provided in the Vizhinjom fishery project in addition to 400 small vessels of less than 15 m. This additional fleet is expected to increase the existing landings by 50,000 tonnes. The 50 large vessels will consist of 18 numbers of 17.5 m, 14 numbers of 22 m and 18 numbers of 27 m. The quantity of shrimp, lobsters and other varieties of fish available for processing from the additional catch of 50,000 tonnes is estimated as follows:

i)	Shrimp (10 per cent)	5,000	tonnes
ii)	Deep-sea shrimp (5 per cent)	2,500	"
iii)	Deep sea lobsters (10 per cent)	5,000	"
iv)	Quality fish for processing (20 per cent)	10,000	"

This will work out to a daily average landing of nearly 37.5 tonnes of shrimp, 25 tonnes of lobster and 50 tonnes of fish from all the vessels. The total yield will be 16.1 tonnes of shrimp, 6.2 tonnes of deep-sea lobsters and 25 tonnes of fish, making a total of 47.3 tonnes for freezing. Allowing for 50 per cent of surplus capacity the harbour area is to be provided with facilities for freezing 100 tonnes of fish. These facilities are divided into two shrimp freezing units of 25 tonnes capacity each and one fish freezing unit of 50 tonnes capacity.

		Rs million
Capital Investment		
i)	Fishing Vessels	
a)	Cost of 400 vessels of 11.6 m @ Rs 0.12 million each	48.00
b)	Cost of 18 vessels of 17.5 m @ Rs 0.75 million each	13.50
c)	Cost of 14 vessels of 22 m @ Rs 1.5 million each	21.00
d)	Cost of 18 vessels of 27 m @ Rs 2.0 million each	36.00
		118.50

		Rs million
ii)	Processing Establishment	
a)	Shrimp freezing units (2 numbers with 4 line graders)	0.30
	IQF freezer	0.50
	Plate freezer (one tonne per charge)	0.50
	Frozen storage (100 tonnes)	0.30
	Chilled storage (100 tonnes)	
b)	Ice plant (25 tonnes)	0.35
	Ice storage (100 tonnes)	
	Utensils and other equipment	0.20
	Water and electric connections	0.20
	Refrigerated trucks (2 numbers)	0.20
	Building	0.10
		2.65
	Cost of two units	5.30
c)	Fish freezing Unit:	
	Skinning machine	0.50
	Frozen storage (200 tonnes capacity)	0.50
	Ice plant (50 tonnes capacity)	0.60
	Chill storage (200 tonnes capacity)	0.50
	Ice storage (200 tonnes capacity)	
	Tunnel (blast freezer 5 numbers with 10-tonne capacity)	1.00
	Equipment and utensils	0.20
	Building	0.10
		3.40

	Rs million
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 18 vessels (17.5 m) @ Rs 0.56 million each	10.08
b) Operating cost of 14 vessels (22 m) @ Rs 0.96 million each	13.44
c) Operating cost of 18 vessels (27 m) @ Rs 1.36 million each	24.48
	48.00
ii) Processing Plants	
a) Processing cost of 3,220 tonnes of shrimp @ Rs 2,200 per tonne	7.08
b) Processing cost of 1,240 tonnes of lobsters @ Rs 1,000 per tonne	1.24
c) Processing cost of 5,000 tonnes of fish @ Rs 2,200 per tonne	11.00
	19.32
Total operating cost	67.32
Export Earnings	
i) Export earnings from 3,220 tonnes of shrimp @ Rs 15,000* per tonne	48.30
ii) Export earnings from 1,240 tonnes of lobsters @ Rs 15,000 per tonne	18.60

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* A higher price of Rs 15,000 per tonne has been taken for shrimp processed in Vizhinjom as the major portion of the catch landed in this area is of medium size grades yielding between 21-35 and 41-50 per pound.

	Rs million
Local Sale	
Sale of 5,000 tonnes of fish locally @ Rs 3,000 per tonne	15.00
Total earnings	81.90

c) Fishmeal and Oil Processing Plants at Calicut, Cannanore and Mangalore

Calicut is one of the major sardine producing areas in Kerala State, the main season being October to December. Nearly 40 per cent of the total landings of 38,000 tonnes during this period constitute sardine. This ensures a daily average landing of 170 tonnes of sardines.

Cannanore is another important centre in Kerala State, where sardines are landed in abundant quantities. Here also about 40 per cent of the fish landings of 40,000 tonnes between October and January are contributed by sardines. On an average 30 tonnes of sardines are landed every day during this period.

Mysore State has recorded a fluctuating catch of sardine during the past. On an average 24,000 tonnes of sardine are landed every year, one-third of this being from Mangalore alone. This puts the total landings in Mangalore at 8,000 tonnes during a period of 100 days between October and January.

The disposition of sardine catch in Calicut, Cannanore and Mangalore calls for the establishment of a canning and a fishmeal unit in Calicut, a fishmeal unit in Cannanore and a fishmeal and canning unit in Mangalore.

Fishmeal and Canning Unit at Calicut

It is proposed that a fishmeal plant with a capacity of 50 tonnes per day and a canning plant with a capacity to handle 20 tonnes of sardine per day may be provided at Calicut. Capital investment involved in the establishment of such a plant is as follows:

Capital Investment	Rs million
i) Fishmeal and oil production plant (complete)	2.50
ii) Canning plant:	
Irregular seamer, two numbers	0.05
Boiler (one number)	0.02
Exhaust Box (two numbers)	0.02
Retort (four numbers)	0.01

		Rs million
	Stainless steel accessories	0.05
	Utensils	0.02
	Building for fishmeal and canning plants	0.15
	Water and electric connections	0.10
	Ice plant (50 tonnes capacity)	0.60
	Ice storage (100 tonnes) and chill storage (100 tonnes)	0.20
	Total capital investment	3.70
Operating Cost		
i)	Raw material cost of 4,500 tonnes of sardine at Rs 200 per tonne	0.90
ii)	Processing cost for 900 tonnes of fishmeal at the rate of Rs 100 per tonne	0.09
iii)	Raw material cost for 1,800 tonnes of sardine for canning at Rs 200 per tonne	0.36
iv)	Processing cost for 6 million cans at 50 paise per can	3.00
	Total operating cost	4.35
Earnings		
i)	Earnings from 900 tonnes of fishmeal at Rs 800 per tonne	0.72
ii)	Returns from 450 tonnes of fish oil at Rs 1,200 per tonne	0.54
iii)	Realisation from 6 million sardine cans at 75 paise per can	4.50
	Total earnings	5.76

The above estimate has been based on the assumption that a plant will be working to full capacity for 90 days in a year. However, during the rest of the season the small quantities of miscellaneous varieties of fish will be available for operation of the plant to half or one third of its capacity.

Fishmeal Plant for Cannanore

As the daily catch in Cannanore is comparatively small, only a 25 tonnes fishmeal and oil plant is recommended for this area. The capital investment for this plant will be roughly Rs 1.7 million including machinery and building. The plant will be in full production for a period of 150 days between October and February.

	Rs million
Operating Cost	
i) Cost of 4,500 tonnes of sardine at Rs 200 per tonne	0.90
ii) Cost of production of 900 tonnes of fishmeal at Rs 100 per tonne	0.09
Total operating cost	0.99

Earnings

		Rs million
i)	Earnings from 900 tonnes of fishmeal @ Rs 800 per tonne	0.72
ii)	Earnings from 450 tonnes of fish oil @ Rs 1,200 per tonne	0.54
	Total earnings	1.26

Fishmeal and Sardine Canning Plant in Mangalore

With an average catch of 80 tonnes of sardine per day in Mangalore one 25-tonne fishmeal plant and a 15 tonne canning plant are proposed for this area. Both the plants will be operating to full capacity for a period of 100 days between October and January.

Capital Investment

		Rs million
i)	Fishmeal plant (25 tonne)	1.70
ii)	Canning plant	0.15
	Building	0.15
	Water and electric connections	0.10
iii)	Ice plant	0.60
	Ice storage and chill storage (100 tonnes each)	0.20
	Total capital investment	2.90

Operating Cost

		Rs million
i)	Cost of 2,500 tonnes of sardine for fishmeal at Rs 200 per tonne	0.50
ii)	Processing cost for production of 500 tonnes of fishmeal at Rs 100 per tonne	0.05
iii)	Cost of 1,500 tonnes of sardine for canning at Rs 200 per tonne	0.30
iv)	Cost of processing 4.9 million sardine cans at 50 paise per can	2.45
	Total operating cost	3.30

Earnings

i)	Realisation from 500 tonnes of fishmeal @ Rs 800 per tonne	0.40
ii)	Earnings from 4.9 million sardine cans @ 75 paise per can	3.68
iii)	Earnings from 250 tonnes of fish oil @ Rs 1,200 per tonne	0.30
	Total earnings	4.38

F. FISHERY PROJECTS IN TAMIL NADU

Tamil Nadu, with a coastline of about 1,000 kms and a continental shelf of 77,700 sq. km. produces on an average about 150,000 tonnes of marine fish per annum, representing about 17 per cent of the total landings in the country. The principal varieties of fish landed include sciaeneds, sardines, prawns, perches, seer, tunnies, mackerel and pomfrets. Of the marine fish landings of 163,000 tonnes in 1968, these varieties together contributed 35 per cent and a variety of other fishes forming the rest. At present about 30,000 indigenous fishing crafts, primarily canoes and catamaran, are in operation in addition to about 900 small mechanised vessels of 9-10 m length.

About 54 per cent of the catch in Tamil Nadu is consumed in fresh form, 35 per cent is dried and only a negligible quantity is frozen at present. The State has 21 ice plants and 27 cold storages in selected landing centres, their installed capacity being 94 tonnes per day and 150 tonnes at a time respectively. A freezing plant with a capacity of 3 tonnes and frozen storage capacity of 50 tonnes has been installed in the State. A freezing plant of 10 tonne capacity, a frozen storage of 50 tonnes and a fishmeal plant (50 tonnes finished product) have been established in the Indo-Norwegian Project at Mandapam. A few small units for freezing have been established by private commercial firms in Madras and Cuddalore. The exports of fish and fishery products from the State during 1967-68 were of the order of Rs 12.5 million.

There are about 40 fishing centres of which Madras, Nagapattinam, Cuddalore, Mandapam, Tuticorin, Cape Comorian and Colachel offer possibilities of commercial exploitation of various exportable varieties of fish.

Compared to the west coast, mainly on account of the lack of landing and berthing facilities very little effort has so far been made for the development of fishing and processing activities on east coast on an industrial basis, although the region has been proved to have sufficient potential to develop and sustain commercial operations. The areas around Mandapam, Tuticorin, Cuddalore and Madras have been indicated as high produtivity areas for shrimp of larger size grades, rock lobsters, perches and breams. Silver bellies, occuring in large quantities form useful and suitable raw material for the production of fishmeal. It is against this background that two fishery projects have been suggested in Mandapam. The outlines of the two proposed Projects are given below:

Model Fishery Project

The fleet will consist of 3 trawlers of 17.5 m length with 200 BHP, 3 trawlers of 22 m size with 350 BHP and 3 trawlers of 27 m fitted with 450 BHP engines. The additional catch expected from the proposed fleet will be as follows:

500 kg shrimp per 17.5 m vessel	-	1.5 tonnes per day
700 kg shrimp per 22 m vessel	-	2.1 tonnes per day
500 kg shrimp per 27 m vessel	-	1.0 tonne per day

This yields a total of 4.6 tonnes shrimp per day. As the shrimp caught in this area is of large size, 60 per cent meat yield can be expected from its catch and as such the daily total availability of processed shrimp will be 2.70 tonnes.

Besides shrimp, the above fleet is also expected to land on an average 23 tonnes of fish per day of which 8 per cent (1.8 tonnes) will be sardines and 30 per cent (6.9 tonnes) of perches, breams and tuna. For freezing the above quantities, an IQF plant of 10 tonne capacity and a tunnel freezer of 6 tonne capacity are proposed.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 3 vessels of 17.5 m length @ Rs 0.75 million each	2.25
b) Cost of 3 vessels of 22 m size @ Rs 1.5 million each	4.50
c) Cost of 2 vessels of 27 m length @ Rs 2.0 million each	4.00
	10.75
ii) Processing Establishment	
IQF freezing unit	0.50
Tunnel freezer for fish (5-tonne capacity)	0.15
Skinning machine for fish	0.30
Ice plants (10 tonnes) and ice storage (50 tonnes)	0.20
Chilled storage (50 tonnes)	0.15
Frozen storage (50 tonnes)	0.15
One Refrigerated truck	0.10
Accessories and equipment	0.13

Canning Unit	Rs million
Boiler - 1 No.	0.02
Seamer	0.005
Exhaust Box	0.005
Retorts (2 numbers)	0.003
Stainless steel utensils	0.002
Building for freezing and canning unit	0.15
Water and electric connection & standby generator	0.20
	2.065
Total capital investment	12.82

Operating Cost

i) Fishing Vessels

a)	Cost of operating 3 vessels (17.5 m) @ Rs 0.56 million each	1.68
b)	Operational cost of 3 vessels (22 m) @ Rs 0.96 million each	2.88
c)	Cost of operating 2 vessels (27 m) @ Rs 1.36 million each	2.72
		7.28

ii) Processing Plants

a)	Cost of processing 552 tonnes of shrimp @ Rs 2,200 per tonne	1.214
b)	Processing cost of 700 tonnes of fish @ Rs 2,200 per tonne	1.54

	Rs million
c) Production cost of 920,000 cans of sardine @Re 1 per can	0.92
	3,67
Total operating cost	10.95
Export Earnings	
Realisation from 552 tonnes of shrimp @ Rs 20,000 per tonne	11.04
Local Sales	
i) Sale of 700 tonnes of fish @ Rs 3,000 per tonne	2.10
ii) Sale of 9,20,000 cans of sardine @ Rs 1.50 per can	1.38
Total earnings	14.52

a) Tuticorin Fishery Project

The type of fishing in Tuticorin project is expected to be similar to the model project, with concentration of effort on shrimp and tuna catch. The Wadge Bank will be exploited for quality fish like perches, sea bream and snapper useful for processing.

The fleet will consist of 400 trawlers of 11.1 m length to 13.8 m length and 50 large vessels of over 15.1 m length. Twenty vessels of 17.5 m and 10 vessels of 22 m length will concentrate on shrimp exploitation. Twenty large trawlers of 27.3 m length will be rigged as combination vessels to operate trawls on the Wadge Bank and long-line for tuna in the appropriate season; these vessels will also serve as mother crafts for handling fishing boats.

The additional shrimp catch from the proposed fleet is estimated at 6,000 tonnes per year and considering the present level of landings at about 2,400 tonnes, the total estimated catch per day will be 42 tonnes. The daily yield from this is expected to be 21 tonnes of shrimp. By introducing purse-seining it may be possible to land 30 tonnes of other sardine species per day during the season. The yield from this is expected at 15 tonnes per day. Quality fish will be filleted and frozen for export.

Capital Investment	Rs million
i) Fishing Vessels	
a) Cost of 20 trawlers of 17.5 m length with 200 BHP @ Rs 0.75 million per vessel	15.00

		Rs million
b)	Cost of 10 trawlers of 22 m length with 300/350 BHP @ Rs 1.5 million per vessel	15.00
c)	Cost of 20 trawlers of 27.3 m length with 400/500 BHP @ Rs 2 million per vessel	40.00
d)	Cost of 400 trawlers of approximately 12 m length @ Rs 0.15 million per vessel	60.00
e)	Cost of gear and equipment for purse-seining	2.00
		132.00

ii) Processing Establishment

a) Freezing (3 units)

3 IQF freezing units of 5 tonnes capacity	1.50
3 one-tonne plate freezers	0.90
	2.40

b)	One ice plant of 15 tonnes capacity (100 tonnes ice storage)	0.40
	Frozen storage (100 tonnes capacity) and chilled fish storage (100 tonnes)	0.15

	Rs million
Building	0.10
Overhead, tanks water connection	0.15
Electric power and standby generator	0.30
Processing equipment and accessories	0.05
Peeling shed	0.05
One refrigerated truck	0.01
Graders	0.052
	1.262
Cost of 3 freezing units	3.786

c) Canning (3 units)

	Rs million
Per unit capacity 25,000 cans per day	0.025
Two large seamer MB 1A	0.035
Six retorts	0.012
Two exhaust boxes	0.01
Utensils and accessories	0.005
Building	0.125
	0.212
Cost of 3 canning units	0.64

d) Fish Freezing (3 units)

	Rs million
One skinning machine	0.50
Three thermal units	0.90
50 tonne ice plant (150 ice storage)	0.725
Chilled storage and frozen storage (100 tonnes each)	0.20
Accessories and buildings	0.20
	2.52
Cost of 3 fish freezing units	7.56
Total investment on processing	14.442

Operating Cost

i) Fishing Vessels

		Rs million
a)	Cost of operating 20 vessels (17.5 m) @ Rs 0.56 million each	11.20
b)	Cost of operating 10 vessels (22 m) @ Rs 0.96 million each	9.60
c)	Cost of operating 20 vessels (27 m) @ Rs 1.36 million each	27.20
		48.00

ii) Processing Plants

		Rs million
a)	Cost of 2,000 tonnes of shrimp @ Rs 4,000 per tonne	8.00
b)	Processing cost of 4,200 tonnes of shrimp @ Rs 2,200 per tonne	9.24
c)	Production cost of 50,000 cans per day @ Re 1 per can (200 days)	10.00
d)	Processing cost of 3,500 tonnes of fish (frozen whole) @ Rs 2,000 per tonne	7.00
		34.24

		Rs million
Export Earnings		
i)	Realisation from 4,200 tonnes of frozen shrimp @ Rs 20,000 per tonne	84.00
ii)	Export earnings from 3,500 tonnes of frozen fillets @ Rs 3,000 per tonne	10.50
iii)	Export earnings from 50 tonnes of frozen lobsters @ Rs 20,000 per tonne	1.00
		95.50
Local Sales		
	Sale of 10 million sardine cans in local markets @ Rs 1.50 per can	15.0
	Total earnings	110.50

b) Madras Fishery Project

The Project at Madras will differ slightly from that of Tuticorin as the nature of the fishing banks off Cuddalore and Nagapattinam are slightly different. The east coast areas being practically virgin shrimp territory, larger vessels proposed to be operated from there will yield better shrimp catches than elsewhere.

The type of fishing will be as shown in the model project with concentration of effort on shrimp and tuna catch. The fleet will consist of 400 trawlers ranging in size from 11.1 m to 13.8 m and 50 medium and large vessels of more than 15.1 m length.

Taking into account 30 per cent of the existing catch being landed in Madras and the additional 5,000 tonnes from the proposed fleet, the total available shrimp at Madras will be 8,400 tonnes which will daily yield 21 tonnes on an average operating for 200 days in a year. It will, therefore, be necessary to have three freezing units of 10 tonnes each with an allowance of surplus capacity of about 33 per cent. Fish catch of trawlers will amount to about 20 tonnes per day with meat yield of 10 tonnes. About 50,000 cans of 8 oz. net weight of sardines per day can be produced from this raw material. Two canning units with a capacity of 25,000 cans per day will be necessary. The large vessels of 27 m length will have to be equipped to operate tuna lines to catch about 2,400 tonnes.

Capital Investment

i) Fishing Vessels

		Rs million
a)	Cost of 20 trawlers of 17.5 m length with 200 BHP @ Rs 0.75 million each	15.00
b)	Cost of 10 trawlers of 22 m length with 350 BHP @ Rs 1.5 million each	15.00
c)	Cost of 20 trawlers of 27.3 m length with 450 BHP @ Rs 2 million each	40.00
d)	Cost of 500 trawlers of approximately 12 m size @ Rs 0.15 million each	75.00
e)	Cost of gear and equipment for purse-seining	2.00
		147.00

ii) Processing Establishment

a) Freezing Units (Three)

Cost of 3 IQF freezing units (5 tonnes capacity)	1.50
Cost of 3 one-tonne plate freezers	0.90
	2.40

		Rs million
b)	One ice plant (15 tonnes capacity with 100 tonnes ice storage)	0.25
	Frozen storage (100 tonnes capacity) and chilled fish storage (100 tonnes capacity)	0.15
	Building	0.10
	Overhead tanks water connections	0.15
	Electric power and standby generators	0.30
	Processing equipment and accessories	0.05
	Peeling shed	0.05
	One refrigerated truck	0.125
		1.175
	Cost of 3 units	3.525
c)	Canning Jnits (two) - 25,000 cans capacity per day	
	Two large seamer MB 1A	0.035
	Six retorts	0.012
	Two exhaust boxes	0.01
	Utensils and accessories	0.005
	Building	0.125
		0.232
	Cost of 2 units	0.464
d)	Fish Freezing	
	One skinning machine	0.50
	Three thermal units	0.90
	Ice plant (50 tonnes and 115 tonnes ice storage)	0.45
	Chilled storage and frozen storage (100 tonnes capacity each)	0.20
	Accessories and buildings	0.20
		2.25
	Total investment on processing units	8.889

	Rs million
Operating Cost	
i) **Fishing Vessels**	
a) Operating cost of 20 vessels (17.5 m) @ Rs 0.56 million each	11.20
b) Operating cost of 10 vessels (22 m) @ Rs 0.96 million each	9.60
c) Operating cost of 20 vessels (27 m) @ Rs 1.36 million each	27.20
	48.00
ii) **Processing plants**	
a) Cost of 4,000 tonnes of whole shrimp from small boats @ Rs 4,000 per tonne	16.00
b) Processing cost of 4,200 tonnes of shrimp @ Rs 2,200 per tonne	9.24
c) Production cost of 10 million cans (1750 tonnes) @ Re1 per can	10.00
d) Processing cost of 1,750 tonnes of frozen fish (whole) @ Rs 2,000 per tonne	3.50
	38.74
Total operating cost	86.74

	Rs million
Export Earnings	
i) Export earnings from 4,200 tonnes of frozen shrimp @ Rs 20,000 per tonne	84.00
ii) Export earnings from 1,750 tonnes of frozen fish @ Rs 3,000 per tonne	5.25
iii) Export earnings from 10 million sardine cans @ Rs 1.50 per can	15.00
iv) Export earnings from 50 tonnes of frozen lobster tails @ Rs 20,000 per tonne	1.00
Local Sales	
Local sale of 35,000 tonnes of fresh fish @ Rs 150 per tonne	5.25
Total earnings	110.50

c) Fishmeal Plant and Shrimp Freezing Plant at Mandapam

A 50-tonne fishmeal plant and a 10-tonne freezing plant are being established in Mandapam under the Indo-Norwegian project. These plants will be operating mainly on the silver belly, shrimp and lobster catch around the Rameshwaram island. It is estimated that the fishmeal plant can work to full capacity for about 150 days in a year and the freezing plant will be producing approximately 500 tonnes of frozen shrimp and 50 tonnes of frozen lobsters per year.

		Rs million
Operating Cost		
i)	Cost of 10,000 tonnes of silver belly @ Rs 100 per tonne	1.00
ii)	Cost of production of 2,000 tonnes of fishmeal @ Rs 100 per tonne	0.20
iii)	Cost of 1,000 tonnes of shrimp @ Rs 7,000 per tonne	7.00
iv)	Cost of processing 600 tonnes of frozen shrimp @ Rs 2,200 per tonne	1.32
v)	Cost of 100 tonnes of lobsters @ Rs 1,000 per tonne	0.10
vi)	Processing cost of 50 tonnes of lobsters @ Rs 1,000 per tonne	0.05
	Total operating cost	9.67
Export Earnings		
i)	Realisation from 2,000 tonnes of fishmeal @ Rs 1,100 per tonne	2.2
ii)	Earnings from 600 tonnes of frozen shrimp @ Rs 20,000 per tonne	12.0
iii)	Export earnings from 50 tonnes of frozen lobsters @ Rs 15,000 per tonne	0.75
	Total earnings	14.95

G. FISHERY PROJECTS IN ANDHRA PRADESH

The coastline of Andhra Pradesh extends to about 960 km. Its annual fish landings amount to an average of 75,000 tonnes. Of the 77,000 tonnes of marine fish landed in 1968, sardines contribute 11.5 per cent, prawns 8 per cent, pomfrets and catfish 5 per cent each, seer fish 4 per cent and mackerel 3 per cent. The rest constituted other varieties of fish.

The existing fishing fleet consists of about 20,000 indigenous crafts, majority of which are canoes and catamaran. In addition to these crafts, there are 189 small mechanised boats some of which are specially designed and fully decked.

The main centres with harbour facilities are being organised at Visakhapatnam and Kakinada, which cater to a fleet of about 80 mechanised boats at present. The remaining vessels land their catches at Bimlipatnam and Nizampatnam. The non-mechanised boats and catamarans land their catches in fishing villages on the beach along the long coastline. Proposals for the development of

Visakhapatnam fishery harbour are reported to be in the final stages and that the work in Kakinada is already in progress.

In spite of the rich fishery potential, the State does not possess sufficient processing facilities for handling and processing various species of fish, including shrimp within the State. One ice and cold storage plant with a small freezing unit is located in Visakhapatnam. A small freezing plant has been established at Kakinada which is not working. In view of the limited facilities a major portion of the catches of shrimp and quality fish move either into the market of Calcutta or to the processing plants in Tamil Nadu and Kerala. The projects outlined below envisage a balanced utilisation of the fishery resources of the State particularly in respect of shrimp and lobsters at the major landing centres, namely, Kakinada and Visakhapatnam.

Model Fishery Project

As the fishery along Andhra Pradesh coast is mainly concentrated on shrimp and tuna the model project fleet will have 6 vessels of 17.5 m and 2 vessels of 27 m size.

Additional catch from the proposed fleet is expected to be as follows:

	Tonnes per day
i) Shrimp	
Catch of 6 vessels (17.5 m) @ 500 kg per vessel	3
Catch of 2 vessels (27 m) @ 700 kg per vessel	1.4
ii) Fish	
Catch of 6 vessels (17.5 m) @ 2 tonnes per vessel	12
Catch of 2 vessels (27 m) @ 3 tonnes per vessel	6
iii) Tuna	
Catch of 2 vessels (27 m) @ one tonne per vessel	2

Thus 4.4 tonnes of shrimp and 2 tonnes of tuna will be available for freezing, which will daily yield 2.2 tonnes of shrimp and 1 tonne of tuna respectively. Of the 18 tonnes of fish, 10 per cent (1.8 tonnes) will be of varieties, like, perch, sciaenids, pomfret and seer and 10 per cent (1.8 tonnes) sardines which can be processed. It is proposed that IQF shrimp freezing plant and the tunnel freezer for freezing fish in the whole form may be provided in the model project.

	Rs million
Capital Investment	
i) **Fishing Vessels**	
a) Cost of 6 vessels of 17.5 m length @ Rs 0.75 million each	4.50
b) Cost of 2 vessels of 27 m length @ Rs 2.0 million each	4.00
	8.50
ii) **Processing Establishment**	
a) **Freezing**	
IQF freezer	0.50
Tunnel freezing unit	0.15.
Frozen storage (50 tonnes capacity)	0.15
b) Ice Plant (10 tonnes capacity) & Ice storage (50 tonnes capacity)	0.20
Chill storage (50 tonnes capacity)	0.05
c) Canning unit with a capacity of 5,000 cans	0.03
Building for canning and freezing units	0.15
Water and electric connections and standby generator	0.20
Total capital investment	9.93
Operating Cost	
i) **Fishing Vessels**	
a) Cost of operating 6 vessels (17.5 m) @ Rs 0.56 million each	3.36
b) Cost of operating 2 vessels (27 m) @ Rs 1.36 million each	2.72
	6.08

	Rs million
ii) Processing Plants	
a) Cost of processing 440 tonnes of frozen shrimp @ Rs 2,200 per tonne	0.97
b) Cost of processing 360 tonnes of fish @ Rs 2,200 per tonne	0.79
c) Production cost of 0.92 million sardine cans @ Re 1 per can	0.92
	2.68
Total operating cost	8.76
Export Earnings	
Export earnings from 440 tonnes of shrimp @ Rs 21,000 per tonne	9.24
Local Sales	
Sale of 360 tonnes of frozen fish* @ Rs 2,000 per tonne	1.08
Sale of 0.92 million sardine cans @ Rs 1.50 per can	1.38
Sale of 2,000 tonnes of fresh fish @ Rs 200 per tonne	0.40
Total earnings	12.10

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* This will be moved to industrial centres and urban areas within a radius of 450-500 kms.

a) Visakhapatnam Fishery Project

In the Visakhapatnam harbour project 60 small vessels of less than 15 m length and 40 medium and large vessels have been provided. The 40 medium and large vessels are divided into 30 numbers of 17.5 m and 10 numbers of 27 m. The additional annual catch from these vessels is expected to be of the order of 12,000 tonnes. The catch is expected to consist of about 10 per cent of shrimp and 20 per cent of quality fish, like perches, seer, tunnies and sciaenids which can be processed. Total availability of shrimp from this project is estimated as follows:

		(Tonnes)
i)	Shrimp catch (10 per cent) from the additional landings;	1,200
ii)	Shrimp available from the existing catch (40 per cent of 6,800 tonnes)	2,720
		3,920

As the prawns caught in this area are of large size and yield 60 per cent meat, it is expected that the total annual availability of frozen shrimp will be of the order of 2,340 tonnes. The varieties of fish for processing which amount to 2,400 tonnes at 20 per cent of the additional catch will be processed in the whole form for marketing in Calcutta and other areas. It is also estimated that about 8,400 tonnes of smaller varieties of fish will be available for local sales.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 30 vessels of 17.5 m length @ Rs 0.75 million each	22.50
b) Cost of 10 vessels of 27 m length @ Rs 2 million each	20.00
c) Cost of 60 vessels of 11.1 m length @ Rs 0.125 million each	7.50
	50.00
ii) Processing Establishment	
Freezing units (two each with 10-tonne capacity)	
IQF freezer	0.50
Tunnel freezer (5 tonnes capacity)	0.15
Ice plant (10 tonnes), ice storage (50 tonnes), chill storage and frozen storage (50 tonnes each)	0.225

	Rs million
Refrigerated truck	0.10
Equipment, utensils and buildings	0.20
	1.45
For two units	2.90
Water, power and standby generator	0.20
Frozen storage (100 tonnes) at the Port	0.30
Total processing establishment	3.40
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 30 vessels (17.5 m) @ Rs 0.56 million each	16.80
b) Operating cost of 10 vessels (27 m) @ Rs 1.36 million each	13.60
ii) Processing Plants	
a) Cost of processing 2,340 tonnes of shrimp @ Rs 1,500 per tonne	3.51
b) Cost of processing 2,400 tonnes of frozen fish @ Rs 500 per tonne	1.20
Total operating cost	35.11

Export Earnings		
i)	Export earnings from 2,340 tonnes of shrimp @ ₨ 20,000 per tonne	46.80
ii)	Export earnings from 50 tonnes of frozen lobsters @ ₨ 20,000 per tonne	1.00
Local Sale		
i)	Sale of 2,400 tonnes of frozen fish locally @ ₨ 3,000 per tonne	7.20
ii)	Local sale of 8,400 tonnes of fish @ ₨ 100 per tonne	0.84
	Total earnings	55.84

b) Kakinada Fishery Project

Only 100 small vessels have been proposed in the Kakinada Fishery Project. Larger vessels cannot be operated in this area due to the restricted depth of the channel connecting the harbour. The additional landings are estimated to be of the order of 5,000 tonnes per year. It is estimated that when the harbour project is complete, about 30 per cent of the existing shrimp catch of Andhra Pradesh will be landed at Kakinada. This, in addition to 10 per cent of the expected additional catch, will make available total shrimp catch of 2,540 tonnes per year in the project area, which will mean an annual yield of 1,270 tonnes of finished product (6.3 tonnes per day).

It is also expected that 20 per cent of fish catch will consist of varieties like perches, seer, etc. amounting to 1,000 tonnes annually which can be processed for local market.

	Rs million
Capital Investment	
i) Fishing Vessels	
Cost of 100 vessels of 11.1 m length @ Rs 0.12 million	12.00
ii) Processing Establishment	
One tonne plate freezer	0.30
Ice plant (10 tonnes) and ice storage (50 tonnes)	0.275
Chill storage (50 tonnes) and frozen storage (50 tonnes)	0.225
Two refrigerated trucks	0.20
Water, electricity and standby generator	0.20
Building	0.125
Utensils and equipment	0.10
	1.425
Operating Cost	
i) Fishing Vessels	
Cost of operating 100 vessels @ Rs 97,000 each	9.70

ii) Processing Costs

Cost of processing of 1,260 tonnes of frozen shrimp @ Rs 2,200 per tonne	2.77
Total operating cost	12.47

Export Earnings

i)	Export earnings from 1,260 tonnes of fresh shrimp @ Rs 15,000 per tonne	18.90
ii)	Export earnings from 50 tonnes of frozen lobsters @ Rs 21,000 per tonne	1.05

Local Sale

i)	Sale of 1,000 tonnes of frozen fish locally @ Rs 3,000 per tonne	3.00
ii)	Local sale of 3,500 tonnes of fresh fish @ Rs 100 per tonne	0.35
	Total earnings	23.30

H. FISHERY PROJECT IN ORISSA

Orissa has a coastline extending over 480 kms. The State has also the largest brackish water area - Chilka Lake - spreading over 1,000 sq. kms. The major fisheries in the State comprise shrimp, lobsters, Bombay duck, seer fish and sharks, of which shrimp and lobsters constitute about 15 per cent of the total landings. It has been estimated that Orissa's contribution to the marine fish landings of India is of the order of 20,000 tonnes. Chilka Lake alone contributes about 4,000 tonnes annually. There is an abundance of shrimp and crab in the Lake.

About 3,000 indigenous crafts are at present engaged in fishing in Orissa in addition to about 140 mechanised boats which are conducting trawling and gill netting operations.

An ice plant with an installed capacity of 15 tonnes and a fishmeal plant are located at Paradeep. A plate freezer of one-tonne capacity with a storage capacity of 15 tonnes is also located in this area.

At Paradeep, the major commercial port developed in Orissa, provision has been made for an inner-harbour for fishing vessels. Due to siltation problem and insufficient dredging the development of the harbour project has almost come to a stand-still.

a) Chandnipal Fishery Project

As in the case of Kakinada, only small vessels have been provided for the Chandnipal harbour project in Orissa. The existing shrimp landings at Chandnipal/ Paradeep are estimated at 5,300 tonnes per annum and the additional catch is expected to be 800 tonnes per annum making a total of approximately 6,000 tonnes of shrimp per year. Taking an average of 50 per cent yield, this quantity is expected to produce daily 15 tonnes of finished product. To handle 15 tonnes of processed shrimp per day, two units of 10 tonnes freezing capacity each are proposed in the project.

	Rs million
Capital Investment	
i) Fishing Vessels	
Cost of 150 vessels of 11.1 m length @ Rs 120,000 each	18.00
ii) Processing Establishment	
Freezing Units (two)	
IQF plate freezer	0.50
Plate freezer	0.11
Ice plant (50 tonnes) and ice storage (50 tonnes)	0.735

	Rs million
Chill storage (50 tonnes) and frozen storage (50 tonnes)	0.225
Two refrigerated trucks	0.20
Building	0.15
Utensils	0.05
Water, electricity and standby power	0.30
	2.28
For two units	4.56
Total capital investment	22.56

Operating Cost

i) Fishing Vessels

Operating cost of 150 vessels (11.1 m) @ Rs 90,000 per vessel	13.50

ii) Processing Plants

Cost of 900 tonnes shrimp from Chilka Lake @ Rs 4 per kg.	3.60
Cost of processing 3,000 tonnes of shrimp @ Rs 2,200 per tonne	6.60
Total operating cost	23.70

Export Earnings

Export of 3,000 tonnes of frozen shrimp @ Rs 15,000 per tonne	45.00

I. FISHERY PROJECT IN WEST BENGAL

The State has a fishable area of 2,600 sq kms including 800 sq kms of in-shore area. The marine fishery in the State has not so far developed to any appreciable extent owing primarily to lack of fishing harbours, cold storages and other ancillary facilities. The State has a fleet of 108 indigenous fishing crafts and 5 mechanised boats. The fish landing centres are located at Kakdwip, Namkhana and Frazengunj catering mainly to the landings of hilsa, bekti and shrimp. At present there are only two small processing plants with a total capacity of about 2 tonnes which are fed by raw material mostly from Orissa.

With the completion of the proposed fishing harbour at Roychauk, it is estimated that landings in this centre would be sufficient to feed a large number of processing units in the State, as also to supply seafoods to meet the increasing needs of the market in Calcutta. The fishery project envisaged for Roychauk aims at fuller exploitation of the reported high potential of fishery resources at the head of the Bay of Bengal.

Model Fishery Project

In the proposed model project for West Bengal a fleet of 6 vessels is provided mainly for shrimp trawling. These are divided into three vessels each of 17.5 m and 22 m length, capital investment for which amounts to Rs 6.75 million. Calculating on an average catch of 500 kgs of shrimp for 17.5 m vessels and 700 kgs of shrimp for 22 m vessels, the total estimated daily catch from the fleet would be 3.6 tonnes which will yield 1.8 tonnes of processed product. To handle this quantity, the minimum requirements would be a 5-tonne freezing unit which will entail the following capital expenditure.

Capital Investment

	Rs million
i) Fishing Vessels	
a) Cost of 3 vessels of 17.5 m length @ Rs 0.75 million each	2.25
b) Cost of 3 vessels of 22 m length @ Rs 1.5 million each	4.50
	6.75

	Rs million
ii). Processing Establishment	
Two plate freezers	0.22
Ice plant (10-tonne) and ice storage (50 tonnes)	0.275
Chill storage (50 tonnes) and frozen storage (50 tonnes)	0.225
One refrigerated truck	0.10
Building	0.15
Processing utensils and equipment	0.05
Water, electricity and standby generators	0.20
	1.22
Total capital investment	7.97

Operating Cost

i) Fishing Vessels	
a) Cost of operating 3 vessels (17.5 m) @ Rs 0.56 million each	1.68
b) Cost of operating 3 vessels (22 m) @ Rs 0.96 million each	2.88
ii) Processing Plant	
Cost of processing 360 tonnes of shrimp @ Rs 2,200 per tonne	0.79
Total operating cost	5.35

Export Earnings

Export earnings from 360 tonnes of frozen shrimp @ Rs 15,000 per tonne	5.40

This excludes sales of fresh fish locally

a) Roychauk Fishery Project

A fleet of 75 small and 18 large vessels has been provided for the Roychauk fishery project with an expected additional annual catch of 20,000 tonnes of fish. Fleet of large vessels is divided into 9 numbers of 17.5 m and 9 numbers of 22 m. Only shrimp landings from these vessels are to be processed for export while the fish landings are likely be sold in the local market in the fresh form. Taking an average yield of 10 per cent from the additional expected catch, 2,000 tonnes of shrimp will be available for processing in a year. The existing shrimp catch is also expected to make available 2,400 tonnes making a total of 4,400 tonnes. This will give a daily yield of 11 tonnes of processed shrimp.

Calcutta area has two processing units at present, each with a one-tonne capacity. Hence 3 additional processing units of 5-tonne capacity each, as proposed in the model project, are envisaged.

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 75 vessels of 11.1 m length @ Rs 0.12 million each	9.00
b) Cost of 9 vessels of 17.5 m length @ Rs 0.75 million each	6.75
c) Cost of 9 vessels of 22 m length @ Rs 1.5 million each	13.50
	29.25
ii) Processing Establishment	
Cost of 3 processing units as in the Model Project	3.21
	32.46
Operating Cost	
i) Fishing Vessels	
a) Operating cost of 9 vessels (17.5 m) @ Rs 0.56 million each	5.04
b) Operating cost of 9 vessels (27 m) @ Rs 0.96 million each	8.64
ii) Processing Plants	
a) Cost of 2,400 tonnes of shrimp from the existing availability @ Rs 4,000 per tonne	9.60
b) Cost of processing 2,200 tonnes of shrimp @ Rs 2,200 per tonne	4.84
	28.12

Export Earnings

Realisation from 2,200 tonnes of frozen shrimp @ Rs 15,000 per tonne	33.00

Local Sale

Sale of 15,000 tonnes of fish @ Rs 200 per tonne	3.00
Total earnings	36.00

J. FISHERY PROJECT IN ANDAMAN AND NICOBAR ISLANDS

The sea fishing in the Andaman and Nicobar group of islands is potentially rich in view of the good biological productivity, with high concentration of nutrients. The coastline of this group of islands is approximately half of the coastline of mainland India.

The present fish production of about 200 tonnes per annum is obtained from a very narrow belt close to the shore. Fishing crafts are limited to a few dinghies. However, the number of large foreign fishing vessels are reported to be regularly operating off Great Nicobar and the Katchall Islands.

There is a large variety of crustaceans, molluscs, tuna, seer, perch, shark, mackerel, sardines and anchovies. Prawn grounds occur in patches around some islands in the southern group as also lobsters. It is proposed to develop harbours at Port Blair, Diglipur and Katchall.

Model Fishery Project

In the harbour project for Andamans a fleet of 50 small vessels below 15 m. length and 15 large vessels ranging in length between 17.5 m and 27.3 m have been provided for Port Blair and 25 small vessels below 15 m length each at Diglipur and Katchall. This additional fleet is expected to land 11,000 tonnes of fish annually, spread over a period of 150 fishing days. About 5 per cent of the total catch is estimated to be shrimp, 15 per cent perches and 10 per cent tuna, which can be processed for export. The quantities thus available will be: shrimp 550 tonnes, perches 1,650 tonnes and tuna 1,100 tonnes. There is no precise information on the quantity of lobsters available in the area. However, as the entire islands are surrounded by rocky belts, it is expected that at least a minimum of 100 tonnes of lobsters would be made available for freezing every year.

At present there is only one ice plant of 5-tonne capacity per day and a cold storage capacity of 15 tonnes. For handling the above quantity it is necessary to provide additional facilities for refrigeration and freezing at the three harbours as indicated below:

		Capacity (Tonnes)
i)	Port Blair	
	Ice plant	15
	Cold storage	50
	Ice storage	100
	Freezing capacity	10
	Frozen storage	200
ii)	Diglipur	
	Ice plant	10
	Cold storage	50
	Ice storage	50
iii)	Katchall	
	Ice plant	15
	Cold storage	50
	Ice storage	100
	Freezing capacity	10
	Frozen storage	200

	Rs million
Capital Investment	
i) Fishing Vessels	
a) Cost of 50 small vessels (below 15 m) @ Rs 0.12 million each at Port Blair	6.00
b) Cost of 25 small vessels (below 15 m) at Diglipur @ Rs 0.12 million each	3.00
c) Cost of 25 small vessels (below 15 m) at Katchall @ Rs 0.12 million each	3.00
d) Cost of 10 vessels (17.5 m) at Port Blair @ Rs 0.75 million each	7.50
e) Cost of 5 vessels (27 m) at Port Blair @ Rs 2.0 million each	10.00
	29.50
ii) Processing Establishment	
Freezing at Port Blair	2.15
Additional frozen storage facility to be provided for two 27 m vessels operating from Port Blair	1.20
Ice plant & chill storage in Diglipur	0.15
Processing facilities at Katchall	2.15
Refrigerated carrier vessels for gillnet and line fishing	1.00
	6.67
Total capital investment	36.17

	Rs million
Operating Cost	
i) **Fishing Vessels**	
a) Operating cost of 10 vessels (17.5 m) @ Rs 0.56 million each	5.60
b) Operating cost of 5 vessels (27.m) @ Rs 1.36 million each	6.80
ii) **Processing Plants**	
a) Cost of 200 tonnes of shrimp @ Rs 4,000 per tonne	0.80
b) Cost of processing of 275 tonnes of frozen shrimp @ Rs 2,200 per tonne	0.60
c) Cost of processing 50 tonnes of lobsters @ Rs 1,000 per tonne	0.05
d) Cost of freezing 2,750 tonnes of frozen fish @ Rs 500 per tonne	1.38
Total operating cost	15.23
Export Earnings	
i) Export earnings from 275 tonnes of prawn @ Rs 15,000 per tonne	4.13
ii) Export earnings from 50 tonnes of frozen lobsters @ Rs 30,000 per tonne	1.50
iii) Export earnings from 2,750 tonnes of frozen fish @ Rs 3,000 per tonne	8.25
Total earnings	13.88

The net returns show a deficit of approximately Rs 2.5 million. In view of the need for development of the fisheries in this region a certain amount of subsidy will have to be given to the State.

K. FISHERY PROJECT IN LACCADIVE ISLANDS

The Laccadive Islands are potentially rich in commercially important varieties like lobsters, crabs, turtle, tuna and skipjack. The skipjack resources are particularly abundant. Some of the tuna vessels belonging to other nations are fishing very close to these islands. The fishermen can be trained without much difficulty in tuna fishing from large vessels. A small mechanised fishing fleet has already been developed. It is desirable to associate the fishermen of Laccadives in any joint venture operations proposed on the west coast.

The survey recommends the addition of 200 small mechanised vessels for operation from the fishing ports at Minicoy and Kavaratti at an estimated cost of Rs 24.0 million. It is also necessary to provide an ice plant, chilled and frozen fish storages.

	Rs million
Capital Investment	
i) Fishing Vessels	
Cost of 200 small vessels (below 15 m) @ Rs 0.12 million each	24.00

ii) Processing Establishment

	Rs million
Ice plant (25 tonnes)	0.35
Chilled & frozen storage	0.50
Freezing plant	0.30
Other items	0.42
Total capital investment	1.57

Operating Cost

i) Fishing Vessels

Cost of operating 200 vessels @ Rs 0.9 million each	18.00

ii) Processing Plants

a) Cost of processing 5,000 tonnes of fish @ Rs 500 per tonne	2.50
b) Cost of processing 25 tonnes of lobsters @ Rs 2,500 per tonne	0.625
Total operating cost	3.175

Export Earnings

i) Export earnings from 5,000 tonnes of fish @ Rs 3,000 per tonne	15.00
ii) Export earnings from 25 tonnes of lobsters @ Rs 20,000 per tonne	0.50
Total earnings	15.50

Commercial Profitability of Fishery Projects

Commercial profitability in respect of the major proposed fishery projects, on the basis of constant prices, is indicated below. The details have been shown in Annexures B-7(i) to B-7(xvii).

State	Centre	Commercial Profitability (percentage)
West Coast		
Gujarat	a) Veraval Project	23
	b) Kandla Pilot Project	18
Maharashtra	a) Sassoon Docks (Bombay) Project	15
	b) Ratnagiri Project	32
Goa	a) Marmugoa Project	25
Mysore	a) Karwar Project	22
	b) Malpe Project	26
Kerala	a) Cochin Project	22
	b) Vizhinjom Project	21
East Coast		
Tamil Nadu	a) Tuticorin Project	28
	b) Madras Project	24
Andhra Pradesh	a) Visakhapatnam Project	44
	b) Kakinada Project	over 50
Orissa	a) Chandnipal Project	over 50
West Bengal	a) Roychauk Project	over 50

(Contd..)

State	Centre	Commercial Profitability (percentage)
Andaman & Nicobar Islands	a) Port Blair b) Diglipur c) Katchall	4
Laccadive Islands	a) Minicoy	loss

In arriving at fixed investment and cost of operation for each project the following assumptions have been made:

a) supply of vessels at international prices on deferred payment terms;

b) supply of duty free fuel to the fishing vessels;

c) adequate availability of infrastructural facilities.

It will be seen from the above that profitability varies between 15 to 32 per cent in the projects on west coast. The projects at Malpe and Ratnagiri show high profitability on account of the availability of large quantities of sardines and mackerel in waters off Malpe and shrimps and lobsters at Ratnagiri. The relatively low profitability shown by projects at Sassoon Docks (Bombay) and Vizhinjom is due to high capital investment involved in the composite units.

On the east coast however profitability ranges between 24 to over 50 per cent. The high profitability indicated by projects at Visakhapatnam, Kakinada, Chandnipal and Roychauk has been attributed relatively to lower investment on boats and the present availability of shrimp off deltaic areas from outside sources at low prices. However, this position is likely to change, once processing industry develops at these centres.

The project at Andaman and Nicobar has low profitability and the one in Laccadive Islands shows loss largely on account of high cost of fuel which has to be supplied from the mainland. This should not deter the fishing operations in these areas as they are replete with quality fish like tuna and lobsters, which are high unit value earners.

Methodology

In order to work out the commercial profitability, different components such as capital investment, cost of operation and gross earnings which go into it have to be initially estimated. The manner in which these have been arrived at is detailed below.

Cost of Capital Investment. The cost of capital investment on fishing vessels with complete gear and the processing plant inclusive of land and buildings in respect of each project has been worked out at current prices.

Cost of Operation. The cost of operation of the fishing vessels and the processing plants has been calculated by taking into account all the major elements of cost which could be quantified. However, indirect items of cost like depreciation on vessels and processing plants, and interest payable on loan finance secured for purchase of these assets have not been taken into account while arriving at the cost of operation. These items of cost have not been accounted for obvious reasons in computing internal rate of return (on a discounted cash flow basis).

Gross Earnings. Gross earnings on each project are calculated on the basis of estimated sales at current prices. To begin with, the net earning of the project is arrived at by deducting the cost of operation, at full capacity, from gross earnings. Assuming a ten-year life span for the assets (vessels and processing plant), the net earnings for each year have been computed at varying percentage rate of capacity utilisation at 70,75,75,80, 100,90,80,70,65 and 60. Such capacity utilisation rate is visualised on the basis of what is prevalent in the industry at present. The total net earning thus estimated over the ten year period is equalised with investment, so as to reach what is popularly known as the internal rate of return (through the appropriate rate of discount). Commercial profitability is thus taken to mean here, the internal rate of return and defined as the rate of interest which yields in terms of present worth, the future sums of profits over the life of a project, equivalent to investment made on it.

Although, each fishery project is envisaged as one composite commercially viable unit, it will necessarily involve quite a few sub-units with small administrative set up of their own. However, the administrative overheads, as an item of expenditure, is negligible in the total operational cost of the project as a whole. The other specific assumptions made in these calculations are:

(1) The fluctuating nature of the raw material supply generally limits the capacity utilisation of the processing plant on an average to 50-60 per cent of the installed capacity. Therefore, when the plant reaches this level, it has been considered equivalent to 100 per cent utilisation of the operational capacity.

(2) The gestation period necessary for bringing the plant to a stage of operation has been taken as one year.

(3) Supply of vessels at international prices and on deferred payment terms.

(4) Duty free supply of fuel to the fishing vessels.

(5) Adequate availability of infrastructural facilities.

1.2 INVESTMENT OUTLAY AND FINANCIAL ASSISTANCE FOR FISHERY DEVELOPMENT PROGRAMME

Loan Finance for Capital Investment

The investment pattern in India will have to conform to the broad principles adopted by other maritime countries based on their long experience. Besides providing the infrastructure the Government should extend financial assistance in the form of loans on easy deferred payment arrangement for purchase of capital items of equipment like fishing vessels, ice-cold storage plants and processing plants. In the initial stages, even if vessels and some items of machinery manufactured in the country satisfy the requirements of quality, the cost is likely to be high for commercial units which have to face international competition. It is, therefore, necessary to provide relief in the capital cost of fishing vessels as subsidy to the extent of the difference between the cost of manufacture of fishing vessels in the country and the international price of similar vessels. Even in cases where foreign credits are available for the purchase of capital items of machinery and fishing vessels, the normal facility of repayment under deferred payment terms should be extended for such purchases.

Tax Relief and Incentives. With regard to the purchase of fishing vessels and processing machinery involving an expenditure of more than Rs 500,000 per unit, institutional finance under deferred payment arrangement as available today in many countries should be extended to the industry in India. The difference between the bank rate and the rates of interest at which finance are given to the fishing industry should be borne by the Government as subsidy. Such an arrangement will help both the fishing industry and the manufacturers of machinery and equipment. Besides, the Government should extend financial assistance to the industry such as tax relief and incentives in the form of :

(a) supply of duty free diesel oil;

(b) loan for capital items of machinery and fishing vessels at concessional rate of interest;

(c) tax holiday for a period of five years for new units or expansion of the existing ones with an investment cost of not less than Rs 500,000;

(d) exemption from income tax for foreign technicians for a period of three years; and

(e) concessional rates of taxation for technical services, including royalties and salaries of foreign technicians.

Investment on Fishing Harbours

Provision of fishing harbours constitutes an essential pre-requisite for the development and expansion of fishing industry. The Survey has, therefore, recommended investment of Rs 435.42 million on fishing harbours over a period of 10 years at various centres where fishery projects are proposed. The phasing of this outlay during the Fourth and Fifth Plans is indicated below:

(Rs million)

	Fourth Plan (1969-70 to 1973-74)	Fifth Plan (1974-75 to 1978-79)
Priority I		
Phase I	225.22	-
Phase II	--	104.20 (by 1975)
Priority II		106.00

The expenditure on harbour facilities, being public service, shall have to be met by the Government of India, if necessary, with assistance from International Agencies like IBRD and Asian Development Bank.

Subsidy for Medium and Large Vessels. Fisheries development programme proposed over a period of next ten years envisages introduction of 3,560 fishing vessels of which 398 fishing vessels will be of medium and large sizes and the remaining 3,162 small mechanised boats. These vessels are estimated to cost Rs 905.83 million. Financial assistance will have to be made available for these vessels in the form of loans and subsidies. Subsidies have been recommended for the medium and large fishing vessels to the extent of the price differential between the cost of construction of these vessels in the country and the comparable international prices. The estimated quantum of subsidy for large fishing trawlers will be as follows:

(Rs million)

Size of trawler	Number	Cost per trawler in India	Total cost in India	International price per trawler	Total cost at international prices	Difference in cost
17.5 metre	210	0.905	190.05	0.525	110.25	79.80
22.0 metre	40	1.870	74.80	0.636	25.44	49.36
27.0 metre	88	2.800	246.40	2.100	184.80	61.60
Total	338	...	511.25	...	320.49	190.76

Source: IIFT Survey Team

45 twenty two metre vessels and 15 twenty seven metre vessels and 15 twenty seven metre vessels will be imported at the cost of Rs 60.12 million. The total amount of subsidy for 338 vessels and foreign exchange for the import of 60 vessels come to Rs 190/.76 million at Rs 60.12 million respectively.

Deep sea fishing being a central subject the subsidy for large vessels will have to be met by the Government of India. The subsidy for small vessels less than 13.8 m should be borne by the State Governments. The loan portion will be raised by the private companies from Scheduled Banks. Industrial Development Bank of India, Agricultural Refinance Corporation and Agricultural Finance Corporation. The cooperatives can obtain this assistance from the Cooperative Banks, Agricultural Refinance Corporation and the IDBI. In the case of large vessels, it has been envisaged that the loan should be made available at reduced rate of interest and the difference in the rate of interest should be provided as subsidy by the Government of India.

Supply of Duty Free Diesel Oil

With regard to the operation of fishing vessels, the Survey recommends duty free supply of fuel to the fishing industry. The extent of loss of revenue on account of duty free diesel oil for the 398 large fishing vessels is indicated overleaf.

Economies of Duty Free Diesel Oil

(Rs million)

Size	Number	Cost of fuel with duty	Duty free cost	Difference
1. 17.5 M - Fishing Trawlers	210	28.25	11.13	17.12
2. 22 M - Fishing Trawlers	85			
3. 27 M - Fishing Trawlers	103	16.05	6.32	9.73
Total	398	44.30	17.45	26.85

In addition, duty free oil to be supplied to the large number of small mechanised fishing boats both existing and new, would mean additional loss of revenue to the extent of Rs 83.22 million per year.

Transport and Cold Storage Facilities. The State Governments should provide facilities and financial assistance for establishment of frozen fish storages in important consuming centres and industrial towns and for refrigerated trucks and insulated carrier boats for transportation of fishery products. The Central Government should extend transport facilities by providing refrigerated rail cars over long distances and help establishment of large cold storages at important landing centres.

Sources of Financial Investment. The investment required to be provided by the Government of India and State Governments, amounts required through institutional finance for capital costs of fishing harbour; fishing vessels, processing machinery, grants and subsidies for fishing vessels, rates of interest, etc. are indicated in next page.

Proposed Investment for Fisheries Development

(Rs million)

Scheme	Govt. of India		State		Instituional Finance	
	No.	Value	No.	Value	No.	Value
1. Mechanisation of Fishing Boats (Small) (11.1 m & 13.8 m)	-	-	3,162	99.59	-	298.77*
2. Medium and Large Size Vessels (17.5 m to 27.1 m)	398	190.76	-	-	398	320.49
3. Fishing Harbours: (1st priority)	21	329.42	-	-	-	-
(2nd priority)	13	106.00				
		435.42				
4. Processing plants	-	-	-	-	-	106.93
5. Transport						
a) Rail	-	17.50	-	-	-	-
b) Road	-	-	-	-	-	2.80
6. Subsidy on interest	-	2.57	-	-	-	-
	-	646.25	-	99.59	-	726.19

*10 per cent of this will be borne by the parties.

Source: IIFT Survey Team

1.3 DEVELOPMENT OF NEW PRODUCT LINES

The Survey has revealed that there is a growing demand for speciality products from fish and shell fish in overseas markets. The South East Asian countries especially Japan have taken the lead in the production of variety of speciality products for export. Europe offers an excellent market for fish and shrimp extracts, fish pastes and other preparations. USA prefers to have frozen fish, fish flakes and other products for convenience packs and snacks.

Besides the exports of shrimp in the block frozen form, it has been recommended elsewhere that shrimp should be frozen in IQF form and marketed in the correct grades in USA, Japan and Europe. It is also necessary to explore the possibility of introducing breaded shrimp subsequently. Some of the overseas markets in Europe like Denmark and Spain prefer to have boiled and frozen whole shrimp. The deep sea shrimp and lobsters which have recently been located off the Indian coasts should be marketed in this manner to meet the demand of Scandinavian and other European markets.

With regard to canned shrimp, a new convenience packing which is expected to provide stiff competition for the conventional tin can and glass jars, has been introduced recently by a European firm. The new container is a polypropylene-lined fabrication of aluminium foil with a similarly coated lid. The synthetic film acts as a plating for the metal and a heat sealing medium for the lid. Products can be sterilised in the package at temperatures upto 120°C to perform the lid sealing process simultaneously. The new containers are light and can be opened with a finger pull thus eliminating can openers and key arrangements. The cost of the new container is comparable to glass containers but slightly more than tin cans.

Canned shrimp imported by Denmark is generally converted into a convenience food by the processors by mixing it with cheese and producing a bottled cheese/shrimp spread (1:2 ratio).

A new procedure for bottling of shrimp developed in Denmark is 2 parts shrimp, 1 part of 15 per cent brine, citric acid to pH 5/6 and benzoic acid (2 parts per mille). The product is packed in plastic jars and stored at 10°C.

In addition, speciality products from shrimp like shrimp extracts and prawn paste could also be manufactured to meet the demands of the overseas markets.

Speciality Products

Shrimp Extract. This is a semi-solid composition which is used as a bread spread. This product is popular in foreign markets especially Britain and it has been possible to duplicate this product using tiny prawns. The method of its preparation is as follows: Tiny prawns (Acetes), obtained from the coast of Maharashtra are dried and powdered well. The powder has the following composition:

TN	26.1 mg/gm.	on dry wt. basis
NPN	37.76 mg./gm.	"
WSN	57.63 mg./gm.	"
X-amino N	9.903 mg./gm.	"
TMA	1.423 mg/gm.	"

The powder is hydrolysed for two hours at pH 5.5 using 0.005 per cent papain at a temperature of 60°C. After hydrolysis, it is concentrated to a moisture content of about 35 per cent and canned, followed by processing at 10 lb./pressure for one hour. The sample has the following compositions:

(Next page)

Composition of Shrimp Extract

Value on Dry wt. basis	Original sample (obtained from UK)	Product from 'Javala' Prawn from Maharashtra
TNS	121.6 mg./gm.	124.3 mg./gm.
NPN	52.52 "	64.45 "
WSN	94.95 "	92.12 "
X-amino N	8.84 "	10.3 "
Moisture	35.43 "	41.23 "
Colour	Greyish black	Brownish black
Odour	Peptone odour	Peptone odour

The processed product has a shelf life of over a year at room temperature.

Prawn Paste. This is a bread spread with sweet or saltish taste and light pink in colour. It is a partially hydrolysed product from prawns and is prepared in the following way. Fresh prawns are blended into equal amount of water and hydrolysed at pH 5.5 using 0.04-0.05 per cent papain for one hour. After hydrolysis, it is concentrated and at the final stage of concentration the following are added:

Prawn meat	
Starch (rice, maida etc.)	6% of the wt. of prawns
Sugar	12-15% "
or salt	3-4% "
Salt (if sugar is added)	1% "
Citric acid	0.01 to 0.2% "
Monosodium glutamate	0.2% "
Agar - agar	0.5% "
Flavouring	2-3 drops

Concentration is completed to a moisture content of 45-50 per cent and canned. It is then processed for 30 minutes at a steam pressure of 10 lbs.

Special Fish Products. With increased additional landings of fish and the possibility of marketing certain fishery products, it has been indicated elsewhere that the scope for developing demand for laminated Bombay duck, canned sardines, canned mackerel, canned eel, and some of the important varieties of frozen fish, either in whole or in fillets like pomfrets, Indian salmon, jew fish, bream and perches to Japan, Europe and USA is attractive. This calls for a dynamic approach for introducing new items in these markets. With regard to canned fish like sardines and smoked eel, it is necessary to use either fish oil or olive oil according to the market preference.

In addition, the fishery projects envisage organisation of commercial fishing operations for landing of tuna, especially skipjack. This fish can be canned or frozen whole to meet the demands of Japanese, US and European markets. Japanese and US markets prefer frozen skipjack, whereas the European markets prefer canned tuna.

In India research has been going on in this line and methods for the preparation of a few products have been worked out and standardised. In all these attempts emphasis has been given on the utilisation of miscellaneous trash fish caught in trawls, which otherwise do not find favour with the local fresh fish markets.

Preparation of meat from miscellaneous trash fish. In the preparation of three products from trash fish, viz. fish flakes, fish soup mix and fish hydrolysate, on which work has been completed, meat has to be prepared in the following manner: The fish is boiled in water for 30 minutes and the meat separated by hand picking. It is then suspended in boiling water for about 30 minutes at pH 5.5 (adjusted by orthophoric acid). It is then pressed in a canvas bag, and the process is repeated thrice. This helps to remove the limpid fractions and most of the odour-bearing components. The partially deodorised pressed cake thus prepared is used in products like fish flakes and soup mix.

Fish Flake. The deodorised fish meat is homogenised into any of the following varieties of starch viz. cora, tapioca, blackgram or 'maida' in the proportion, given in next page.

Deodorised fish meat	1 kg.
Starch	1.25 kg.
Water	2.50 to 2.75 kg.
Salt	40 gm.
Permitted food colour, if required	traces.

Homogenisation is done in a blender. It is then poured on polythene sheets placed in flat aluminium trays. The trays are then passed through a steam chamber on a belt conveyer at a speed of 1 metre per minute. Cooking takes 20 minutes and the cooked film after cooling to room temperature is cut into flakes of about 2.5 x 2.5 cm size. The flakes are then spread on trays and dried in a tunnel drier at a temperature of 70°C. The drying time is about 2 hours at 70°C and 4 to 5 hours at 50°C.

The product is packed in polythene bags and is found to have a shelf life of over one year at room temperature. As polythene bags are permeable to moisture, moisture proof bags are better. The product is found to absorb about 4 per cent moisture in polythene bags of different gauges.

The fish flakes prepared from corn flour have the following composition:

Moisture	7.40%	Calcium as Cao.	450 mg%
Protein	19.59%	Phosphorus	123 mg%
Salt	4.31%	Iron	11.7 mg%
Fat	1.04%	Calorific value	
Ash	5.63%	(fried sample)	488.0

Fish Soup Mix. The partially deodorised meat prepared as shown in the case of fish flakes is again dispersed in equal amount of water and kneaded well. It is then added to an initially fried composition of onion, coriander and vegetable fat in quantities as shown below. It is boiled, colled to room temperature and poured in aluminium trays and dried in an artificial drier at 70°C. After drying, the mass is powdered along with other ingredients like glucose, milk powder etc.

Fish press cake	100	
Salt	26.6	To be fried
Fat	17.7	
Onion	166.0	
Coriander powder	2.2	
Starch (maida)	44.0	
Skim milk powder	17.7	(as dietary supplement)
Glucose	8.8	(sweetner)
Pepper	2.2	(Flavouring agent)
Ascorbic acid	0.22	(antioxidant)
Sodium carboxy methyl cellulose	0.44	(emulsifying agent)
$NaHSO_3$	0.22	(as preservatice)

Colouring matter (traces) if required.

The product prepared in the laboratory has the following composition:

Moisture	7.82%
Protein	28.8%
Fat	11.2%
Salt	8.3%

Mineral:

Calcium	285 mg.%
Phosphorus (P_2O_5)	790 "
Ash	14.3%
Silica	0.468%

Vitamin

Vitamin A	1100.0
Riboflavin	0.029 mg.%
Niacin	0.453 "
Folic acid	0.412 Micro mg.%
Pantothenic acid	0.248 mg.%
Vitamin B_{12}	0.261 millimicro gm.

Free amino acids

Arginine	246.3 mg.%
Methionine	229.5 "
Lysine	168.3 "
Tryptophane	29.68 mg.%
Threonine	
Valine	165.70 "
Histidine	134.3 "
Leucine	346.8 "
Isoleucine	196.8 "
Cystine	62.92 "
Calorific value	490/100 gm.

The product is packed in polythene lined aluminium bags. It has a shelf life of 5-6 months at room temperature. The factors governing the spoilage when stored at room temperature are mostly the browning reaction between protein and carbohydrates and also the rancidity of fat. But in refrigerated temperature the product can remain for over a year.

Fish hydrolysate. It has been also found that the deodorised trash fish meat can be used for the preparation of protein supplementing agent in biscuits, bread, beverages and also in the preparation of nourishing products like bournvita. The method of preparation is as follows:

The partially deodorised meat is mixed into 4 N hydrochloric acid or 4 N sulphuric acid in the ratio 2:3 and hydrolysed for 4 hours, at 15 lb. steam pressure. After neutralisation (the acid is neutralised by adding required amount of 10 N sodium hydroxide) the pH of the hydrolysate is exactly adjusted to a value of 6.8 - 7.0.

After neutralisation, it is filtered. The filtrate can be concentrated to a thick paste of moisture content of about 50 per cent or partially concentrated to thick solution and dried over steam bath followed by vacuum drying for about half an hour, to a powder. The first two are packed in cans and the product vacuum dried in air tight containers. It can be incorporated in the products mentioned above or used as such as a flavouring agent. The yield of product on hydrolysis of trash fish meat is given overleaf.

(Next page)

Hydrolysis	Total yield on dry wt. basis per 100 gm. dry meat
1 hour	74.13
2 hours	92.58
3 hours	96.45
4 hours	94.21

It contains the following essential amino acids:

Arginic	3.12	gm.%
Glutanic acid	7.43	"
Glycine	2.14	"
Histidine	0.99	"
Leucine	3.72	"
Isoleucine	2.14	"
Methionine	1.93	"
Threonine	1.13	"
Tryptophane	0.12	
Valine	2.84	

Satisfactory results have been achieved on the preparation of products similar to bournvita by using the hydrolysates.

Tuna Paste. Cleaned tuna can be cooked in an automaclave for one hour at 10 pounds steam pressure and the meat separated. The meat can be blended well while adding 325 - 350 ml. water per kg. Other ingredients can be added filled in cans and processed at 12 pounds for one hour. The composition of ingredients is given in next page.

Fish meat (cooked)	5 kg.
Starch (rice, maida etc.)	2.5 kg.
Sugar	0.3 kg.
Salt	0.25 kg.
MSG	0.02 - 0.04 kg.
Hydrogenated fat	0.3 kg.
Water	1.5 - 2 litres.

It has been found that black meat of tuna can also be used for the preparation after an initial bleaching by 0.5 per cent H_2O_2 for 30 min. followed by boiling and washing.

The product can remain in good condition for 2 years at room temperature.

Mackerel and Sardine pastes. Mackerel can be cooked and its meat used for preparation of pastes. In the case of sardines, it can be initially cooked in water and the separated meat partially deodorised by the same process employed in the case of trash fish meat. The meat can then be mixed with other ingredients with the following composition:

Cooked meat	35 parts
Fat (hydrogenated oil)	10-12 parts
Salt	2 parts

(Contd..)

Starch	2 parts
Water	22 parts
Colour (permitted food colour)	traces

The paste obtained is canned and processed at 10 lb. pressure for one hour.

Fish paste from Bombay duck. Fresh Bombay duck after dres and washing well is immersed in 20 per cent brine for 30 minutes. It is then cooked at 10 pound steam pressure. The cooked fish is blended well, filled in cans and processed at 15 lbs. for 60 minutes. The product contains 76 per cent moisture, 16 per cent protein and 2.8 per cent salt. Flavour can be enhanced by adding 1 per cent pepper powder. Shelf life has been found to be six months at room temperature.

Fish cake from Doma. Doma, miscellaneous fish, which is available in plenty along Bombay coast does not always find a ready market. This can be utilised indirectly by using it for the preparation of fish cake as follows:

The fish after dressing and washing is treated with 15 per cent brine containing sodium hexametaphosphate and sodium tripolyphosphate (ratio 2:1) for 30 minutes. It is then steamed for 15-20 minutes. Bones are then removed and the following ingredients incorporated:

Starch (boiled potato)	25 - 30%
Spice powder	1 - 3%
MSG	0.02 - 0.04%
Salt	0.5 - 1%

After blending, the mass is moulded into desired shapes. It is then coated with starch by dusting maida or tapioca powder, packed in polythene paper and kept frozen until it is consumed.

Crab concentrate. Crabs are dipped in boiling water for 20 minutes. Meat is separated and blended into equal amount of water. Salt is added to taste and the blend is concentrated in a steam heated pan to 65% moisture. It is then filled in cans and processed at 10 lb. pressure for 1 hour. The analytical characteristics of the product prepared from Indian crab as compared with those of imported product are given as under:

	Sample	Indian Product
TN(DWB)	96.32 mg./gm.	98.75 mg./gm.
NPN	35.77 "	32.5 "
X-amino N	3.65 "	7.8 "
WSN	41.71 "	44.22 "

1.4 SHRIMP EXPORT DEVELOPMENT AUTHORITY

Organisational Problems

Next only to USA, India occupies second place in the world landings of shrimp. Its shrimp catches have increased from 62,800 tonnes in 1961 to 99,800 tonnes in 1968 recording a rise of 59 per cent during this period. Major proportion of shrimp landings at present are effected from within 20 fathoms line (36 metres). Limited exploratory studies and oceanographic surveys have indicated rich potential of this valuable fishery in the Indian coast in the depth upto 200 fathoms (360 metres). This huge potential, however, has not been exploited on account of lack of unified, organised and integrated effort, more so when the fisheries development happens to be the State subject and the role of the Central Government being to look after exploratory and research investigations in off-shore and deep sea areas beyond territorial waters.

Of a wide variety of fisheries which occur along the west and east coasts of India, shrimp and other crustaceans form the most important constituent of the marine fish landings. The shrimp fishery with exports of Rs 212 million in 1968-69 contributing 85.4 per cent to the total exports of marine products has assumed special significance during the last decade. As a matter of fact, this fishery has still tremendous export potential and exports of processed shrimp, according to the survey, can be stepped up to a modest sum of Rs 550 million by 1973-74 and Rs 627 million by 1978-79. Achievement of export performance of such magnitude would necessitate the development of this fishery at a much faster pace than it has been hitherto possible, requiring remedial measures for encountering the following:

(1) Heavy concentration of processing facilities in the south-west region of the country, particularly in the Kerala State, has resulted in high raw material prices on account of short supply, whereas the east coast and the north-west coast of the country do not have necessary processing capacity despite the availability of raw materials. This calls for a regulated development of the processing industry.

(2) The growth of merchant exporters without their own processing facilities has created unhealthy competition to established exporters by over-bidding the raw material prices at home and by being indifferent to the realisation of competitive prices abroad. Some of them are also ill-equipped to supply uniform quality and honour delivery schedules. This results in the distortion of the image of Indian products in the overseas markets. Therefore, a suitable code of conduct requires to be enforced to remedy the situation. Besides, there is urgent need for the seafood industry to explore the possibility of promoting a few common brand names with a view to projecting a sound image of the Indian products abroad.

(3) Indian processors are at present accustomed to block processing of shrimp and it is necessary to encourage them to undertake Individually

Quick Frozen (IQF) processing in view of the overseas consumer's preferences and high unit value realisation. Besides, they should also be encouraged to introduce mechanisation at various stages of processing, such as beheading, grading, sorting and peeling required for mass production.

(4) There is an urgent need for broadening and strengthening the present inspection system backed by necessary research and technical know-how, to include bacteriological standards and hygienic standards for processing establishments and specifications for packaging materials. This would call for introduction of a comprehensive in-plant inspection system in India on the pattern of other supplying countries like South Korea, Mexico, Canada, Japan, Norway and UK. This is all the more desirable against the background of pending legislation in USA which aims to bring processed fishery products, both internal and external under mandatory inspection. This involves heavy organisational responsibility which can be shouldered only by a common co-ordinating agency.

(5) The existing agencies like Deep Sea Fishing Organisation, the Indo-Norwegian Project and the Central Marine Fisheries Research Institute are not yet fully equipped to undertake exploratory deep sea fishing. Left to private enterprise, systematic and scientific exploration of resources is not feasible on account of the magnitude of investment involved. This calls for mobilisation of organisational effort with financial assistance from the Government.

Experience of Other Countries

In order to develop the shrimp fishery on proper lines, it is essential to bring it under a unified and centralised control of an agency, responsible to look after all developmental aspects including production, processing and export marketing. The results achieved by the successful functioning of the various centralised agencies in other maritime countries like the UK, Mexico, Netherlands, Norway, Thailand and Hong Kong in respect of their fisheries highlight the need and efficacy of the institutional development. The salient features of some of these organisations such as the White Fish Authority and the Herring Industry Board in UK, the Commodity Board for Fish and Fish Products in Netherlands, Norwegian Fishermen Sales Organisation in Norway, and Fish Marketing Organisations in Thailand and Hong Kong are described below:

United Kingdom. In United Kingdom, the White Fish Authority constituted under the Sea Fish Industry Act, 1951 is empowered to develop the White Fish Industry and to keep under review matters of importance relating to this industry. The Authority's responsibility covers the whole of UK and the industry comprising fishing vessels, wholesalers, retailers, processors, fish mongers and fish friers. A White Fish Industry Advisory Council also exists in UK to advise the Authority in the exercise and performance of its general functions. The principal powers of the Authority relate to finance, loans, grants for fishing vessels and engines, loan assistance for processing plants, grants for training, financial assistance to cooperatives for research and development work including market and economic research. The main functions of this Authority are as follows:

i) To carry on research and experiment either alone or in collaboration with others and for that purpose provide or acquire, equip and operate vessels or plants, and to give financial assistance to others carrying on research or experiments;

ii) To encourage persons engaged in the White Fish Industry to make voluntary arrangements on a cooperative basis for the selling of white fish or the buying of materials and other requisites for the industry (including in particular gear, fuel and stores for fishing vessels), and to give financial or other assistance in bringing any such arrangements into operation;

iii) To undertake as agents, in any locality in which the Authority think it necessary so as to secure proper provision for the needs of the fishing industry, and first sale of white fish landed in Great Britain and, where it appears to the Authority likely to promote efficiency and economy, to undertake as principals the buying and selling of such materials and requisites as aforesaid;

iv) To promote the export of white fish by establishing, or by encouraging and giving financial or other assistance for the establishment of selling agencies and storage facilities outside the United Kingdom, and by other means;

v) To provide or acquire, equip and operate plants for processing white fish in Great Britain in any locality in which the Authority think it necessary so as to secure proper provision for the needs of the fishing industry;

vi) To give financial assistance by way of loan to others to meet capital expenditure incurred in providing, acquiring, reconditioning or improving -

  i) fishing vessels or their gear; or
  ii) plants for processing white fish in Great Britain.

vii) To give financial assistance by way of grant for the maintenance while taking a course of specialised training or education of persons engaged or employed in the white fish industry or intending to do so;

viii) To encourage, by means of publicity and by advice and instruction, the improvement of conditions in the white fish industry and the greater consumption of white fish;

ix) To regulate the handling and storage of white fish on fishing vessels registered in Great Britain, and for regulating the handling of white fish during or at any time after landing;

x) To fix timing for landings of white fish so as to secure regularity in the supply and prevent congestion in harbours, and for that purpose requiring fishing vessels proposing to land their catch in Great Britain to land or delay landing it if so directed in accordance with the regulations;

xi) To regulate the sale of white fish including the conditions of the sale than the prices;

xii) To prescribe standards of quality for white fish, and to limit the purpose for which fish of any of the standards may be used.

For the development of the herring fishery, another statutory organisation known as the Herring Industry Board was set up in UK under the Herring Industry Act, 1935.

The Board is empowered to engage directly in herring industry to operate vessels and gear as also to undertake schemes for the purchase and disposal of fresh and cured herring and to engage in economic research and market development. The Board has powers to regulate fishing, curing, processing and sale including export of herring. It has powers to fix minimum prices, to make grants and loans for the construction and/or improvement of fishing vessel.

Mexico. The Fishing Law of Mexico limits shrimp fishing to only those fishermen who are members of cooperatives. This has led to the establishment of National Bank for Development of Cooperatives which exercises an effective control in the major fields of production, introduction of fleet and setting up of freezing plants especially on the Pacific Coast. It also controls the export of shrimp from Mexico to USA and Japan.

On the east coast of Mexico the fishermen's cooperatives provide manpower for fishing vessels belonging to the private companies and receive a contract price per tonne of shrimp, fixed by negotiation by the cooperative and the firms once in every three years. Similar arrangements exist on the west coast also except that the vessels on this coast are owned by the cooperatives and a portion of the shrimp is processed by private companies for the cooperatives who market them through the Ocean Garden and the Crest Import Company.

Netherlands. In Netherlands there is Commodity Board for Fish and Fish Products, which was established by an Act in 1956. Some of the principal functions of this Board include -

i) Registration of fish enterprising;

ii) Licensing for the landing of sea fish, herrings, shrimp and mussels;

iii) Issue of licences for the sale of fresh water fish by the inland water fishermen;

iv) Enforcement of compulsory sale at the auctions of fish meant for human consumption;

v) Fixing of minimum landed prices for sardines, herrings, fresh herrings a a number of sea fish varieties, shrimp and mussels;

vi) Prescribing quality standards for shrimps and mussels and with regard to landings and sales of fish;

vii) Laying down specifications with regard to handling of salted herrings and fresh herrings;

viii) Issue of Import and Export Licences;

ix) Issue of quality prescriptions in case of export; and

x) . **Stimulation** of sale of certain fishery products with the aid of funds contributed by the industry;

Norway. The fishing industry in Norway functions on a cooperative basis. All vessels, freezing plants, canning plants and fish meal plants are privately owned. The sales organisations for marketing of fresh fish and export of processed product are under the cooperatives sales organisations. The Norwegian Fishing Organisation established in 1929 a fishermen's sales organisation and an export trade organisation to promote and develop export of its fishery products. The Raw Fish Act of 1951 in Norway amended in 1956 provides that the Government should prohibit the marketing, processing or export of fish unless the first hand sales of fish takes place through or with the permission of the fishermen's sales organisation. So far 13 such sales organisations have been established and 98 per cent of the quantity of 96 per cent of the value of all first hand sale of fish landed in Norway goes through them. About 45 freezing plants in Norway some 15 years ago cooperated to compete in the international market for frozen fish exports and to maintain the position of Norway as one of the leading fishing nations in Europe.

Thailand. In Thailand a fish marketing organisation was established under a special Act in 1953 with the object of wholesale marketing of fish products and licensing of fish agents for the purpose. The Fish Marketing organisation collects 1 per cent of the sales effected from the fish agents for its administrative expenditure and of this 75 per cent is earmarked for the future development programmes. The main objectives of this Organisation are:

i) To carry out, control and direct services in connection with business of fish agents, transport and other related matters;

ii) To carry out and improve the business of fishermen and growth and fishing industry;

iii) To promote the welfare or occupation of fishermen and growth of fishing villages; and

iv) To promote cooperative societies or associations.

Hong Kong. The Government of Hong Kong by a special Ordinance on Marine Fish Marketing passed in 1962 (revised in 1964) provides for the control of the landings and wholesale marketing of marine fish. It empowers the government to control the imports and exports of fish and fish products including establishment of a Fish Marketing Organisation. The functions of this Fish Marketing Organisation are -

i) To establish, regulate and conduct wholesale fish markets, depots and ancillary establishments;

ii) To buy, sell and pack fish and develop export markets;

iii) To hire out anything required in the production, auction or sale and transport of fishery products;

iv) To provide services as may be necessary for improvement of marketing of fishery products;

v) To provide for education, health and welfare of persons employed in the industry; and

vi) To advance loans to persons employed in the fishery industry.

Shrimp Export Development Authority

Shrimp industry having attained a unique place from the viewpoint of exports, the Survey recommends that, to begin with, it is necessary to immediately bring this industry under a unified and centralised control of a statutory agency on the lines of similar organisations in other maritime countries. The Survey also recommends the establishment of another centralised agency for other fisheries like tuna, sardine, mackerel and other fish as and when they reach a certain level of development and importance as attained by the shrimp fishery. Such an organisation for shimp fishery may be called the "Shrimp Export Development Authority" and should also include within its purview other potential items

SHRIMP EXPORT DEVELOPMENT AUTHORITY
(SEDA)

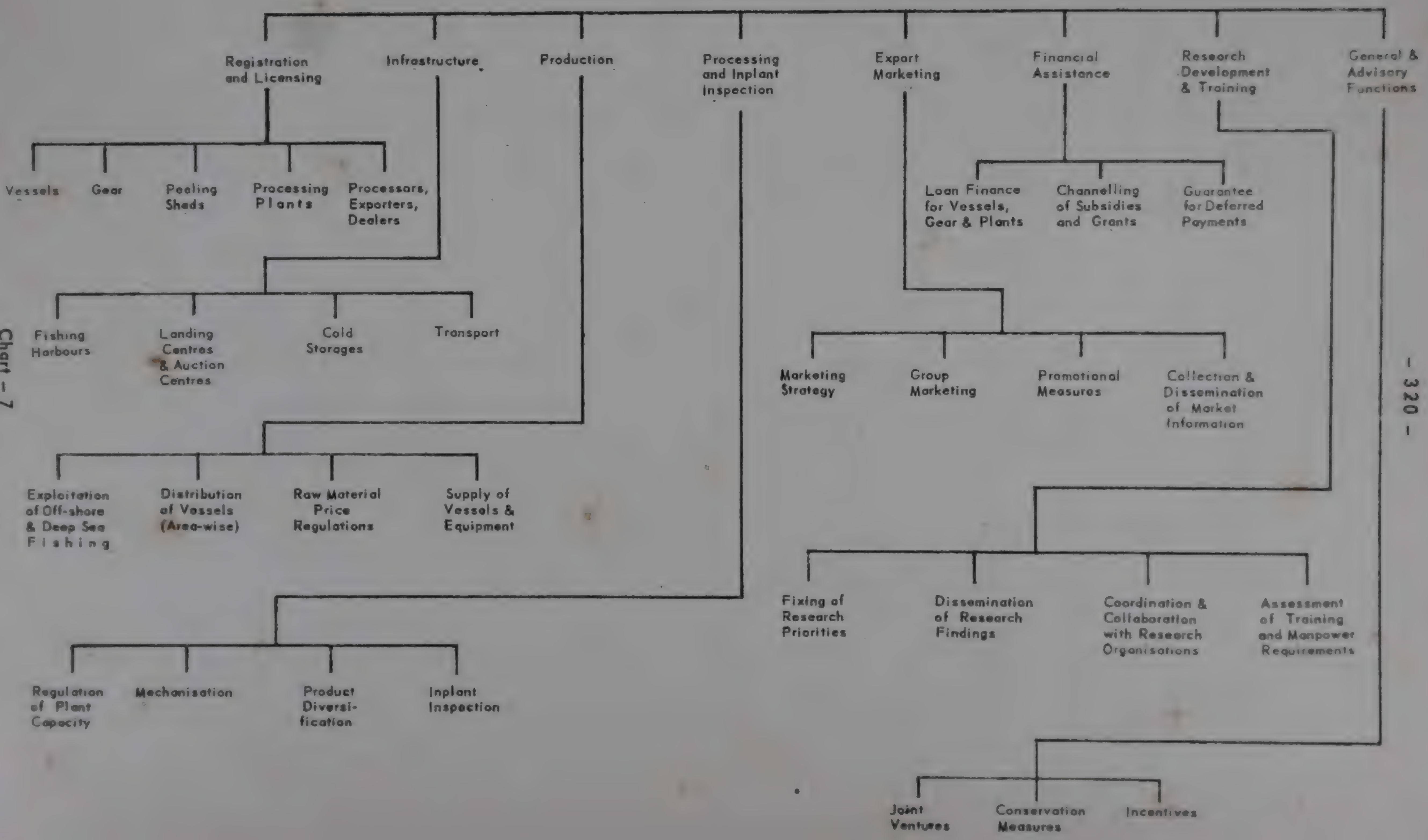

Registration and Licensing
Infrastructure
Production
Processing and Inplant Inspection
Export Marketing
Financial Assistance
Research Development & Training
General & Advisory Functions
Vessels
Gear
Peeling Sheds
Processing Plants
Processors, Exporters, Dealers
Fishing Harbours
Landing Centres & Auction Centres
Cold Storages
Transport
Exploitation of Off-shore & Deep Sea Fishing
Distribution of Vessels (Area-wise)
Raw Material Price Regulations
Supply of Vessels & Equipment
Regulation of Plant Capacity
Mechanisation
Product Diversification
Inplant Inspection
Loan Finance for Vessels, Gear & Plants
Channelling of Subsidies and Grants
Guarantee for Deferred Payments
Marketing Strategy
Group Marketing
Promotional Measures
Collection & Dissemination of Market Information
Fixing of Research Priorities
Dissemination of Research Findings
Coordination & Collaboration with Research Organisations
Assessment of Training and Manpower Requirements
Joint Ventures
Conservation Measures
Incentives

Chart – 7

like lobster tails, crabs, froglegs and other products in the beginning. The Authority, having adequate financial resources, should be vested with the following functions:

1. Registration and Licensing

    i) To register and license the shrimp fishing craft and gear, either independently or through delegation of powers to the Directorates of Fisheries in the maritime States.

    ii) To undertake registration and licensing of peeling sheds, processing plants, and export enterprises.

    iii) To register all dealers of shrimp including agents and merchant exporters.

2. Infrastructure and related facilities

    i) To assess from time to time and specify in advance the requirements of fishing harbours in maritime States.

    ii) To provide a net-work of common landing centres with provision of auctioning facilities through municipal or local authorities, organisations and associations.

    iii) To provide cold storage and other facilities at the landing centres either independently or in cooperation with other agencies.

    iv) To arrange transport facilities at the fishing harbours with a view to ensuring economy and speed in handling and transportation of shrimp to processing plants.

3. Production

i) To augment raw material availability by encouraging exploitation of off-shore and deep sea shrimp resources for ensuring adequate shrimp supplies to the processors.

ii) To regulate the introduction and operation of shrimp fishing vessels of various sizes in different fishing zones according to the availability of resources.

iii) To regulate landings of shrimp so as to secure regularity in its supply and prevent congestion in harbours.

iv) To determine minimum and maximum landed shrimp prices and to ensure their enforcement.

v) To prescribe and enforce standards of quality for shrimp with regard to landing and limiting the purposes for which shrimp of any of the standards may be used.

vi) To review the position of availability of vessels, machinery, equipment and spares including ancillary materials; to encourage their production indigenously at reasonable costs; and to arrange for their import, wherever necessary.

vii) To suggest the manufacture of new and modern items of equipment.

4. Processing Facilities

i) To regulate and limit the processing capacity in accordance with the availability of raw materials with a view to reducing the extent of the present unutilised capacity and to encourage diversification of the industry in comparatively less developed areas while recommending creation of additional capacity.

ii) To encourage the processors to have their own peeling sheds near the processing plants and to persuade the existing peeling sheds to conform to the prescribed standards.

iii) To ensure introduction of mechanisation for various processes like beheading of shrimp, shelling and grading, at present carried out manually.

iv) To encourage the industry to undertake product diversification, such as IQF, breaded shrimp, etc. which are in demand in the overseas markets.

5. Export Marketing

i) To devise marketing strategy as required by the major overseas consuming markets.

ii) To encourage the promotion of joint marketing group or groups under a few selected brand names and to evolve a common pricing strategy with a view to preventing unhealthy inter se competition among Indian exporters.

iii) To collect market intelligence in important overseas markets through its resident representatives for transmission to the industry.

iv) To take up the question of fixation of specific rates from time to time in respect of certain grades and markets for the benefit of the industry.

v) To organise promotional campaign in overseas markets.

vi) To help in the settlement of claims through its representatives stationed in principal overseas markets.

6. In-Plant Inspection

i) To prescribe and enforce norms and standards for in-plant inspection for -

- a) Shrimp fishing vessels
- b) Peeling sheds
- c) Processing plants
- d) Shipment

ii) To help and guide the processing industry in improving and maintaining the quality of its products.

7. Research and Development

i) To carry out research and experiments either independently or in collaboration with other research agencies and for that purpose to provide, acquire, equip and operate vessels or processing plants in any region on the Indian coast.

ii) To inform and educate the shrimp industry about the latest developments taking place in other developed countries.

iii) To lay down priorities for research on various problems faced by the industry and to coordinate research work among the concerned research institutions.

iv) To purvey research findings of interest to the industry.

8. Manpower Requirements

i) To assess and indicate from time to time the manpower requirements of the fishing and processing sectors of the industry.

ii) To assist the industry in obtaining the services of qualified foreign technicians, where necessary, for a limited period.

iii) To arrange opportunities of advanced training abroad for technical personnel engaged in the shrimp industry.

9. Financial Assistance

i) To arrange financial assistance by way of loans to the shrimp fishing and processing units to meet their capital expenditure in acquiring, reconditioning or improving their fishing vessels, gear and processing plants.

ii) To channel subsidies and grants as may be sanctioned by the Government from time to time.

iii) To issue guarantee for purchasing shrimp trawlers on deferred payment basis.

10. General Functions

i) To scrutinise and recommend to the Government requests emanating from the shrimp industry for the setting up of joint ventures for exploiting the deep sea and off-shore shrimp resources.

ii) To suggest conservation measures and prevent over-fishing in areas where such an action is needed.

iii) To recommend to the Government items to be included in the list of import entitlements and the nature of other incentives to be offered to the industry.

iv) To coordinate the demand and availability of reefer space and to regulate the shipments from the existing as well as new areas.

v) To undertake such other activities which will directly or indirectly improve, organise and develop the shrimp industry.

Legislation of SEDA

Considering the nature of the functions spelt out in the preceding paragraphs covering registration and licensing, regulation and control over the processing capacity and prices, coordination between various Central, State and other financial agencies, it is necessary that the Authority is vested with statutory powers. Certain difficulties are, however, currently apprehended in the establishment of such an Authority on account of the varying nature of the constitutional status of the subjects to be covered as indicated below:

(a) 'Fisheries' appear as entry 21 of the State List in the Seventh Schedule of the Constitution of India. Similarly 'industries' appear as entry 24 of the State List.

(b) Fishing and fisheries beyond territorial waters appear as entry 51 of the Central List in the Seventh Schedule. Further, entry 52 of the Central List vests in the Union Government the power to make laws in respect of such of the industries, control of which by the Union is declared by Parliament by law "to be expedient in the public interest".

(c) Price control, however, is covered under entry 34 of the Concurrent List, thus, giving powers both to the Centre and the States to legislate in this behalf.

It will thus be seen that fishing beyond territorial waters, exports of fish and fish products, control of prices and quality control come under the jurisdiction of the Central Government, while fisheries upto the territorial waters and 'industry' as a whole fall under the State List.

Seafoods have assumed great importance as an export oriented industry on account of the increasing overseas demand for animal proteins which constitute an important item in the nutritional requirements of the people. The present level of India's export performance can be maintained and, in fact, improved upon by systematic exploitation of the rich potential of the Indian seas, where some of the large fishing vessels and trawlers of USSR, Japan, South Korea and other countries have been operating for shrimp and tuna to India's disadvantage. Exploitation of deep sea fishing has thus assumed great urgency.

As mentioned earlier, on account of the constitutional provisions it is necessary that steps are taken to declare fishing and fishery industry as an industry of public importance so as to pave the way for the introduction of the proposed legislation relating to the Shrimp Export Development Authority.

ANNEXURES

Annexure A1

Present and Projected Exports of Marine Products from India

Qty: Tonnes
Val: Rs million

Item	1968-69*		1973-74+		1978-79+	
	Qty	Val	Qty	Val	Qty	Val
Shrimp/prawn						
a) Frozen	16,315	180.24	34,200[a/]	487.00[a/]	50,000	703.00[b/]
b) Canned	2,166	25.45	4,500	53.00	6,600	78.00
c) Dried	1,076	6.03	1,500	10.00	2,400	16.00
Froglegs frozen	565	6.49	900	10.35	1,000	11.50
Lobstertails frozen	393	9.19	500[c/]	12.00	1,000[c/]	43.50
Sardines, canned	Negl	Negl	1,250	13.00	2,458	93.41
Fish, frozen (Pomfret, Dara, Ghol, Bream, Perches, Skipjack, Cuttlefish, Puffer fish, Jellyfish, Scarfish etc.)	9[d/]	0.08	100	0.90	27,730	83.19[e/]
Mackerel, canned	Negl	Negl	100	0.40	5,854	27.14
Eel, canned	Negl	Negl	100	1.00	1,200	13.08
Tuna canned	Negl	Negl	100	0.69	1,200	7.20
Fish dried (Bombay duck, Spratt, Angulva etc.)	5,374	14.12	5,500	14.58	8,900	32.90

Contd..

Item	1968-69*		1973-74+		1978-79+	
	Qty	Val	Qty	Val	Qty	Val
Sharkfins and fishmaws	271	4.16	300	4.60	400	6.10
Fish meal	295	0.19	500	0.50	7,330	6.97
Miscellaneous (including turtle, seaweed, beche-de-mer, cuttle fish, fish oil, pickles and pastes, sea shells, etc.)	347	1.02	500	1.50	4,178	58.01
Total	26,811	246.97	50,050	609.43	150,000	1,180.00

* Actual

+ Estimated

a/ includes 200 tonnes of deep sea lobsters accounting for estimated value of Rs 3 million

b/ includes 1,000 tonnes of deep sea lobsters realising Rs 15 million

c/ does not include deep sea lobsters, which are covered under shrimps

d/ includes pomfret and dara

e/ owing to large scale handling, improvements in quality, introduction of new varieties and diversification of products and markets, frozen fish by 1978-79 is anticipated to yield higher returns.

Source: IIFT Survey Team

Annexure A2

Market-wise Export Projections

Qty: Tonnes
Val: Rs million

Country/Item	1973-74		1978-79	
	Qty	Val	Qty	Val
Frozen Shrimp/Prawn				
USA	20,520	292.00	27,500	403.00
Japan	10,260	147.00	16,000	235.00
Australia	684	10.00	1,000	15.00
UK, West Germany, France, Switzerland and Canada	2,736	38.00	5,500	80.00
Total	34,200	487.00	50,000	733.00
Canned Shrimp				
USA	1,350	15.90	1,800	23.40
UK	1,580	18.55	2,100	27.30
France	670	7.90	720	9.35
Canada	230	2.70	480	6.30
West Germany	180	2.10	240	3.00
Switzerland	130	1.55	180	2.35
Italy Netherlands Denmark Belgium Sweden	360	4.30	480	6.30
Total	4,500	53.00	6,000	78.00
Dried Prawn				
Hong Kong	750	5.00	1,200	8.00
Singapore	225	1.50	360	2.40
UK	225	1.50	360	2.40
Hawaii	45	0.30	72	0.48
Netherlands	45	0.30	72	0.48

Country/Item	1973-74		1978-79	
	Qty	Val	Qty	Val
Ceylon	210	1.40	336	2.24
Mozambique				
France				
New Zealand				
Total	1,500	10.00	2,400	16.00
Froglegs				
USA	315	3.62	350	4.02
France	325	3.73	370	4.23
Belgium	225	2.59	250	2.88
Others	35	0.41	30	0.37
Total	900	10.35	1,000	11.50
Lobster Tails				
USA	400	9.60	1,966	34.80
Scandinavia	40	0.96	198	3.48
UK	30	0.72	147	2.61
Spain	30	0.72	147	2.61
Total	500	12.00	2,458	43.50
Sharkfins and Fishmaws				
Singapore	158	2.22	212	3.24
UK	64	0.92	100	1.28
Hong Kong	75	1.05	84	1.52
Others	3	0.41	4	0.06
Total	300	4.60	400	6.10

Country/Item	1973-74		1978-79	
	Qty	Val	Qty	Val
Dried Fish				
Ceylon	4,125	10.93	6,713	24.68
Mauritius	440	1.17	716	2.63
USA UK West Germany Scandinavia	550	1.46	895	3.29
Total	5,500	14.58	8,950	32.90
Frozen Fish				
USA	15	0.13	4,110	12.5
Japan	25	0.22	6,930	20.8
UK	14	0.13	3,880	11.6
Scandinavia	13	0.12	3,610	11.2
Singapore	10	0.09	2,770	8.3
West Germany	9	0.08	2,490	7.5
East European Countries	10	0.09	2,780	8.5
Others	4	0.04	1,160	2.7
Total	100	0.90	27,730	83.1
Canned Sardines				
UK	250	2.6	6,200	18.9
West Germany	187	1.9	4,600	14.1
France	150	1.6	3,000	9.1
Libya	125	1.3	3,200	9.7
Sudan	115	1.2	3,200	9.7
East Germany	110	1.1	3,000	9.1
Poland	125	1.3	2,800	8.5
Others	188	2.0	4,700	14.3
Total	1,250	13.0	30,700	93.4

Country/Item	1973-74		1978-79	
	Qty	Val	Qty	Val
Canned Mackerel				
Libya	15	0.06	900	4.2
Sudan	10	0.04	850	3.9
Poland	25	0.10	1,200	5.6
East Germany	10	0.04	800	3.7
UK	20	0.08	1,000	4.6
Others	20	0.08	1,104	5.1
Total	100	0.40	5,854	27.1
Canned Tuna				
USA	30	0.18	360	2.1
Japan	20	0.12	240	1.4
Canada	15	0.09	190	1.1
West Germany	20	0.12	240	1.4
Italy	10	0.06	120	0.8
Others	5	0.03	60	0.4
Total	100	0.60	1,200	7.2
Canned Eel				
Denmark	25	0.25	260	2.7
Poland	20	0.20	240	2.6
West Germany	15	0.15	230	2.5
Sweden	13	0.13	150	1.6
USA	12	0.12	120	1.4
Japan	12	0.12	130	1.4
Others	3	0.03	70	0.8
Total	100	1.00	1,200	13.0
Fishmeal				
West Germany	175	0.18	2,300	2.25
East Germany	150	0.15	2,100	1.98
Poland	125	0.12	2,000	1.85
Others	150	0.05	930	0.89
Total	500	0.50	7,330	6.97

Annexure A3

State-wise Investment, Estimated Production and Exports of Marine Products by 1978-79

Qty: Thousand tonnes
Val: Rs million

State	No. of Projects	Fishing Vessels		Capital cost of processing facilities	Total capital cost	Operational cost		Additional Fish Landings		Exports* by 1978-79	
		No.	Capital Cost			Fish-ing	Proce-ssing	Qty	Val	Qty	Val
Gujarat	4	437	92.00	13.10	105.10	41.30	29.88	60.70	61.70	6.65	59.65
Maharashtra	3	555	129.25	17.10	146.35	9.00	2.53	87.66	99.27	9.67	89.34
Goa	1	75	9.00	1.39	10.39	1.32	1.43	7.50	6.41	0.80	4.48
Mysore	2	230	42.58	6.06	48.64	17.37	42.51	34.25	32.20	16.72	85.07
Kerala	2	505	195.25	17.35	211.60	103.92	61.70	119.18	140.20	22.68	170.84
Tamil Nadu	2	1,000	275.00	19.38	294.38	149.10	46.59	166.00	187.00	18.75	200.75
Andhra Pradesh	2	200	62.00	4.30	66.30	40.10	7.48	41.40	47.44	4.70	70.80
Orissa	1	150	18.00	4.56	22.56	17.10	6.60	14.00	14.10	3.00	45.00
West Bengal	1	93	29.25	3.21	32.21	13.68	4.84	18.40	19.62	2.20	33.00
Andamans	3	115	29.50	6.67	36.17	13.25	1.98	13.00	6.50	3.08	13.88
Laccadives	1	200	24.00	1.57	25.57	18.00	0.88	15.00	5.00	5.03	15.50
Other Processing units	4	-	-	7.20	7.20	-	-	1.05	1.20	10.95@	34.30
Total	26	3,560	905.83	101.89	1,006.47	424.14	206.42	578.14	620.64	104.23	822.61

* Represents export from the Projects. The remaining export earnings estimated at Rs 357.39 million will accrue from other centres.

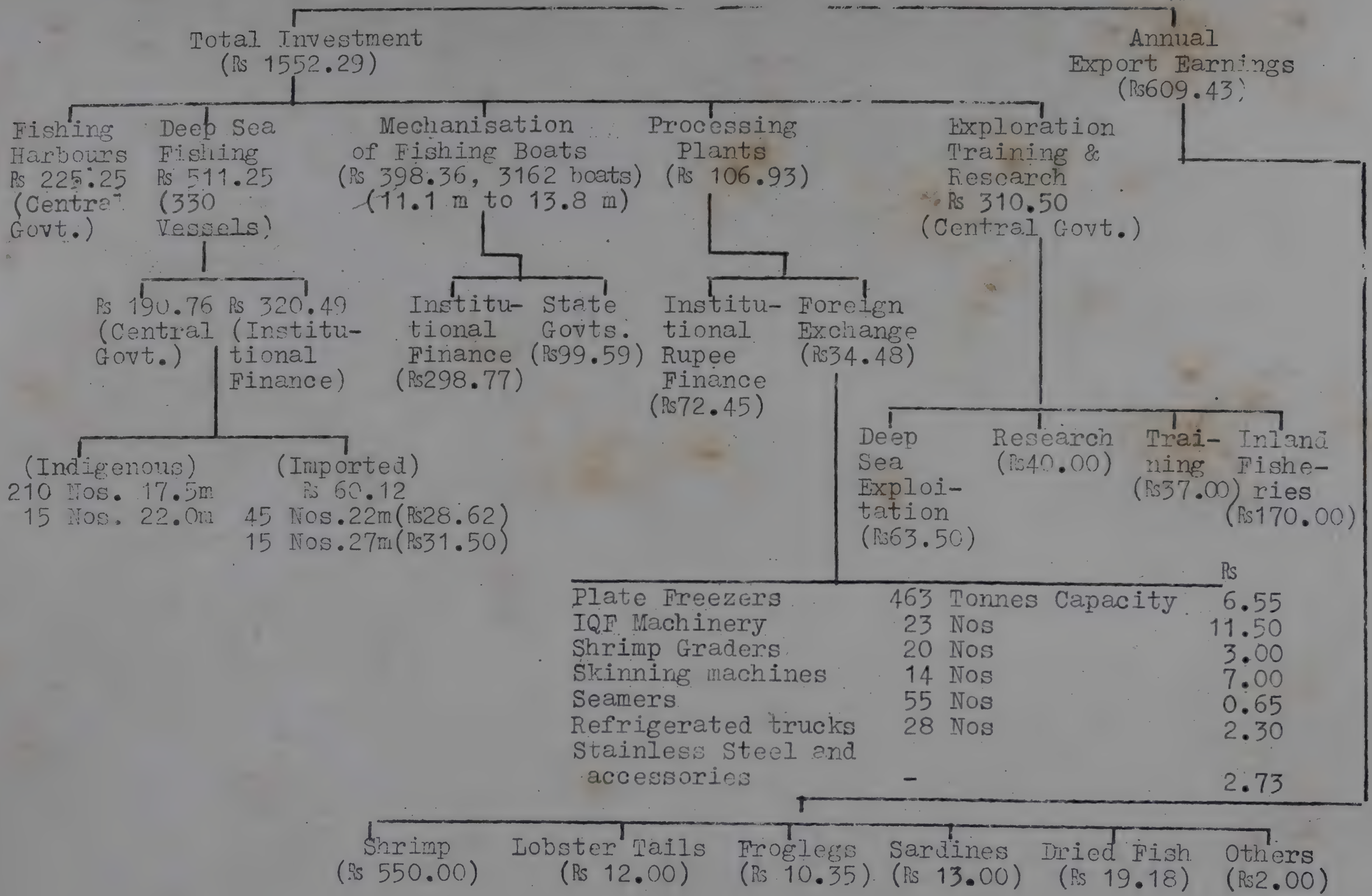
@ Also includes miscellaneous items like turtles, seaweed, beche-de-mer, cuttle fish, pickles, pastes, sea shells etc. contributed in varying quantities from different centres.

Source: IIFT Survey Team.

Annexure 14

INVESTMENT AND FOREIGN EXCHANGE EARNINGS
(1969-70 to 1973-74)

(Rs million)


Total Investment
(Rs 1552.29)
Annual
Export Earnings
(Rs609.43)
Fishing
Harbours
Rs 225.25
(Central
Govt.)
Deep Sea
Fishing
Rs 511.25
(330
Vessels)
Mechanisation
of Fishing Boats
(Rs 398.36, 3162 boats)
(11.1 m to 13.8 m)
Processing
Plants
(Rs 106.93)
Exploration
Training &
Research
Rs 310.50
(Central Govt.)
Rs 190.76
(Central
Govt.)
Rs 320.49
(Institu-
tional
Finance)
Institu-
tional
Finance
(Rs298.77)
State
Govts.
(Rs99.59)
Institu-
tional
Rupee
Finance
(Rs72.45)
Foreign
Exchange
(Rs34.48)
(Indigenous)
210 Nos. 17.5m
15 Nos. 22.0m
(Imported)
Rs 60.12
45 Nos.22m(Rs28.62)
15 Nos.27m(Rs31.50)
Deep
Sea
Exploi-
tation
(Rs63.50)
Research
(Rs40.00)
Trai-
ning
(Rs37.00)
Inland
Fishe-
ries
(Rs170.00)
Shrimp
(Rs 550.00)
Lobster Tails
(Rs 12.00)
Froglegs
(Rs 10.35)
Sardines
(Rs 13.00)
Dried Fish
(Rs 19.18)
Others
(Rs2.00)

		Rs
Plate Freezers	463 Tonnes Capacity	6.55
IQF Machinery	23 Nos	11.50
Shrimp Graders	20 Nos	3.00
Skinning machines	14 Nos	7.00
Seamers	55 Nos	0.65
Refrigerated trucks	28 Nos	2.30
Stainless Steel and accessories	-	2.73

Export Earnings

1973-74: Rs 609.43
1978-79: Rs 1180.00

Annexure B-1

Estimated Exports of Marine Products from Projects Proposed in Fishing Harbours (including new harbours to be completed)

Qty: Tonnes
Val: Rs million

State	Shrimps		Bombayduck		Frozenfish		Lobstertails, frozen		Sardines, canned		Mackerel, canned		Tuna, canned		Eel, canned		Fishmeal		Fishoil	
	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val
Gujarat																				
Kandla	400	6.00	-	-	250	0.75	50	1.05	-	-	-	-	-	-	-	-	-	-	-	-
Veraval	2,400	36.00	-	-	-	-	50	1.05	-	-	-	-	-	-	-	-	400	0.40	-	-
Jaffrabad	-	-	2,600 500*	10.40 4.00*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maharashtra																				
Sasson Dock (Bombay)	3,000	45.00	-	-	4,000	12.00	50	1.05	-	-	-	-	-	-	1,200	13.08	250	0.28	-	-
Ratnagiri	1,125	16.88	-	-	-	-	50	1.05	-	-	-	-	-	-	-	-	-	-	-	-
Goa																				
Marmugoa	200	3.00	-	-	-	-	-	-	600	1.48	-	-	-	-	-	-	-	-	-	-
Mysore																				
Karwar	540	5.40	-	-	-	-	-	-	3,600	11.25	1,018	4.32	-	-	-	-	260	0.29	-	-
Malpe	4,100	41.41	-	-	-	-	-	-	7,200	22.40	-	-	-	-	-	-	-	-	-	-
Kerala																				
Cochin	5,520	55.20	-	-	-	-	300	4.80	6,000	20.23	2,800	14.25	1,200	7.20	-	-	1,600	1.28	800	0.96
Vizhinjam	3,220	48.30	-	-	-	-	1,240	18.60	-	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu																				
Tuticorin	4,200	84.00	-	-	3,500	10.50	50	1.00	-	-	-	-	-	-	-	-	-	-	-	-
Madras	4,200	84.00	-	-	1,750	5.25	50	1.00	5,000	15.00	-	-	-	-	-	-	-	-	-	-
Andhra Pradesh																				
Kakinada	1,260	18.90	-	-	1,000	3.00	50	1.05	-	-	-	-	-	-	-	-	-	-	-	-
Visakhapatnam	2,340	46.80	-	-	-	-	50	1.05	-	-	-	-	-	-	-	-	-	-	-	-

Contd..

State	Shrimps		Bombayduck		Frozenfish		Lobstertails, frozen		Sardines, canned		Mackerel, canned		Tuna, canned		Eel, canned		Fishmeal		Fishoil	
	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val
Orissa																				
Chandnipal	3,000	45.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Bengal																				
Roychauk	2,200	33.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Andaman and Nicobar Is.																				
Port Blair, Diglipur and Katchall	275	4.13	-	-	2,750	8.25	150	1.05	-	-	-	-	-	-	-	-	-	-	-	-
Laccadive Is.																				
Minicoy	-	-	-	-	5,000	15.00	25	0.50	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total	37,980	573.02	3,100	14.40	18,250	54.75	2,015	33.70	22,400	70.38	3,818	18.57	1,200	7.20	1,200	13.08	2,510	2.25	800	0.96

* : Laminated Bombay Duck
Source : IIFT Survey Team

Annexure B-2

Estimated Exports of Marine Products by Providing Additional Processing Facilities (excluding Projects Proposed in Fishing Harbours)

Qty: tonnes
Val: Rs million

Item		Versova	Mangalore	Cannanore	Calicut	Mandapam	Total
Bombay Duck	Qty:	1,550	-	-	-	-	1,550
	Val:	7.20	-	-	-	-	7.20
Sardine, Canned	Qty:	-	1,500	-	1,800	-	3,300
	Val:	-	3.68	-	4.50	-	8.18
Fish Meal	Qty:	-	500	900	900	2,000	4,300
	Val:	-	0.40	0.72	0.72	2.20	4.04
Fish Oil	Qty:	-	250	450	450	-	1,150
	Val:	-	0.30	0.54	0.54	-	1.38
Shrimp frozen	Qty:	-	-	-	-	600	600
	Val:	-	-	-	-	12.00	12.00
Lobster Tails	Qty:	-	-	-	-	50	50
	Val:	-	-	-	-	1.50	1.50
Total	Qty:	1,550	2,250	1,350	1,150	2,650	10,950
	Val:	7.20	4.38	1.26	5.76	15.70	34.30

Source: IIFT Survey Team

Annexure B-3

State-wise Distribution and Costs of the Proposed Fishing Vessels by the end of 1978-79

Rs million

Name of State/ Area	11.1m	11.1m	13.3m	17.5m	22.0mm	27.3m	Total	
							No.	Value
Gujarat including Diu-Damon	Kandla	-	-	-	4	3	7	12.00
	Veraval	400	-	20	10	-	430	80.00
Maharashtra Ratnagiri	Bombay	250	-	44	14	7	315	99.25
	Ratnagiri	240	-	-	-	-	240	30.00
Goa	Marmugoa	75	-	-	-	-	75	9.00
Mysore	Karwar	35	9	6	-	-	50	10.73
	Malpe	150	18	12	-	-	180	31.85
Kerala including Mahe	Cochin	-	-	21	14	20	55	76.75
	Vizhingom	400	-	18	14	18	450	118.50
Tamil Nadu including Pondicherry Karaikkal	Tuticorin	400	-	20	10	20	450	130.00
	Madras	500	-	20	10	20	550	145.00
Andhra Pradesh	Visakhapatnam	60	-	30	-	10	100	50.00
	Kakinada	100	-	-	-	-	100	12.00
Orissa	Chandnipal	150	-	-	-	-	150	18.00

Contd..

Name of State/ Area		11.1m	13.8m	17.5m	22.0m	27.3m	Total	
							No.	Value
West Bengal	Roychauk	75	-	9	9	-	93	29.25
Andaman and Nicobar Islands	Port Blair Diglipur Katchall	100	-	10	-	5	115	29.50
Laccadive Islands		200	-	-	-	-	200	24.00
Grand Total		3,135	27	210	85	103	3,560	905.83

Source: IIFT Survey Team

Annexure B-4

State-Wise Distribution and Costs for the Proposed Processing Facilities by 1978-79

Capacity in tonnes unless
otherwise stated
Cost in Rupees million

State	Port	Ice Plant		Ice Storage		Chill Storage		Freezing		Frozen Storage		Canning		Fish Meal		Refrigerated Trucks		Total
		Cap	Cost	Cap	Cost	Cap	Cost	Cap	Cost	Cap	Cost	Cap	Cost	Cap	Cost	Nos	Cost	
Gujarat including Diu Damon	Kandla	15	0.25	100	0.150	75	0.100	4	0.26	100	0.30	-	-	-	-	2	0.20	1.26
	Veraval	16	0.90	300	0.090	15	0.060	30	1.80	300	0.45	-	-	10	0.30	2	0.20	3.80
Maharashtra	Bombay	120	1.80	600	0.180	300	0.120	60	3.60	1,100	1.70	-	5.45	-	-	6	0.60	13.45
	Ratnagiri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goa	Marmugoa	25	0.30	100	0.150	-	-	4	0.20	100	0.30	-	-	-	-	-	-	0.95
Mysore	Karwar	10	0.20	50	0.075	50	0.075	10	0.52	50	0.15	-	0.45	10	0.35	1	0.10	1.92
	Malpe	20	0.40	100	0.150	100	0.150	20	1.04	100	0.35	-	0.90	20	0.70	2	0.20	3.89
Kerala	Cochin	200	2.50	500	0.400	500	0.400	-	-	1.000	1.50	-	1.35	50	2.50	-	-	8.65
	Vizhingom	100	1.20	400	0.350	400	0.350	100	2.00	400	1.00	-	-	-	-	2	0.20	5.10
Tamil Nadu	Tuticorin	65	0.75	250	0.275	200	0.080	75	3.30	200	0.50	-	0.70	-	-	3	0.30	5.91
	Madras	65	0.75	250	0.275	200	0.080	75	3.30	200	0.50	-	0.46	-	-	1	0.10	5.47
Andhra Pradesh	Kakinada	10	0.20	50	0.075	50	0.075	10	0.30	50	0.15	-	-	-	-	2	0.20	1.00
	Vishakapatnam	20	0.40	100	0.150	100	0.150	20	1.30	100	0.30	-	-	-	-	2	0.20	2.50
Orissa	Chandnipal	100	1.20	100	0.150	100	0.150	20	1.22	100	0.30	-	-	-	-	2	0.20	3.22
West Bengal	Roychauk	30	0.60	50	0.075	50	0.075	15	0.66	50	0.15	-	-	-	-	3	0.30	1.86
Andaman Nicobar Islands	Port Blair Diglipur Katchall	40	0.80	250	0.250	150	0.200	20	1.30	400	0.80	-	-	-	6	28	-	3.35
Laccadive Islands		25	0.40	100	0.200	100	0.070	-	-	100	0.40	-	-	-	-	-	-	1.07
Total		861	12.65	3,300	2,995	2,390	2,135	463	20.80	4,350	8.85	-	9.31	90	3.85	28	2.80	63.40

Source: IIFT Survey Team

Annexure B-5

Foreign Exchange Requirements for the Processing Sector for the Project Plans

Cost: Rs million

State	Area	Refrigerated Trucks		Plate Freezer		Shrimp Grader		IQF		Skimming Machine		Stainless Steel and accessories	Seamers		Total
		Nos	Cost	Nos	Cost	Nos	Cost	Nos	Cost	Nos	Cost	Cost	Nos	Cost	
Gujarat	Kandla	2	0.20	1	0.11	-	-	-	-	1	0.05	0.05	-	-	0.860
	Veraval	2	0.20	2	0.22	2	0.28	2	1.00	2	1.00	0.15	-	-	2.850
Maharashtra	Bombay	-	-	6	0.66	6	0.84	6	3.00	6	3.00	0.60	24	0.30	8.400
	Ratnagiri	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysore	Karwar	1	0.10	2	0.22	2	0.28	1	0.50	-	-	0.15	6	0.075	1.325
	Malpe	2	0.20	4	0.44	2	0.28	2	1.00	-	-	0.30	12	0.150	2.370
Goa	Marmugoa	-	-	2	0.22	-	-	-	-	-	-	-	-	-	0.220
Kerala	Cochin	-	-	-	-	-	-	-	-	-	-	0.30	3	0.060	0.360
	Vizhingom	2	0.20	2	0.50	2	0.28	2	1.00	1	0.50	0.15	-	-	2.630
Tamil Nadu including Pondicherry	Tuticorin	3	0.30	3	0.90	3	0.52	3	1.50	3	1.50	0.45	6	0.036	5.206
	Madras	1	0.20	3	0.90	3	0.52	3	1.50	3	0.50	0.30	4	0.024	3.944
Andhra Pradesh	Kakinada	2	0.20	1	0.30	-	-	-	-	-	-	0.05	-	-	0.550
	Vishakapatnam	2	0.20	-	-	-	-	2	1.00	-	-	0.10	-	-	1.300
Orissa	Chandnipal	2	0.20	2	0.22	-	-	2	1.00	-	-	0.10	-	-	1.520
West Bengal	Roychauk	3	0.30	6	0.66	-	-	-	-	-	-	0.15	-	-	1.110
Andaman and Nicobar Islands		-	-	4	1.20	-	-	-	-	-	-	-	-	-	1.200
Other Processing Centres (machinery for canning and fish-meal plants)		-	-	-	-	-	-	-	-	-	-	-	-	-	0.630
Total		22	2.30	38	6.55	20	3.00	23	11.50	14	7.00	2.85	55	0.645	34.480

Source: IIFT Survey Team

Annexure B-6

Investment on Fishing Vessels and Processing Plants for the Fishery Projects and the Estimated Foreign Exchange Earnings by 1978-79

Val: Rs million

State	No. of Project Centres	Fishing Vessels No.	Fishing Vessels Value	Processing Facilities Value	Total Capital (4+5) Cost	Foreign Exchange Requirements for Processing Equipment Value	Additional Fish Landings '000 tonnes	Export Earnings Value
Gujarat	4	437	92.00	13.10	105.10	3.71	60.70	59.65
Maharashtra	3	555	129.25	17.10	146.35	8.40	87.66	89.34
Goa	1	75	9.00	1.39	10.39	0.22	7.50	4.48
Mysore	2	230	42.58	6.06	48.64	3.70	34.25	85.07
Kerala	2	505	195.25	17.35	212.60	2.99	119.18	170.84
Tamil Nadu	2	1,000	275.00	22.90	297.90	9.15	166.00	200.75
Andhra Pradesh	2	200	62.00	4.82	66.82	1.85	41.40	70.80
Orissa	1	150	18.00	4.56	22.56	1.52	14.00	45.00
West Bengal	1	93	29.25	3.21	32.46	1.11	18.40	33.00
Andaman and Nicobar Is.	3	115	29.50	6.67	36.17	1.20	13.00	13.88
Laccadive and Minicoy Is.	1	200	24.00	1.57	25.57	-	15.00	15.50
Processing units: Mandapam Mangalore Cannanore Calicut	4	-	-	8.20	8.20	0.63	1.05	34.30[@]
Grand Total	26	3,560	905.83	106.93	1,012.76	34.48	578.14	822.61

@ : Also includes miscellaneous items like turtles, seaweed, beche-de-mer, cuttle fish, pickles, pastes, sea shells etc. contributed in varying quantities from different centres.

* : Represents export from the Projects. The remaining export earnings estimated at Rs 353.39 million will accrue from other centres.

Annexure B-7(i)

Investment and Commercial Profitability of Veraval Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	80.000
	(b) Processing Plant	7.040
	Total	87.040
II.	**Cost of Operation**	
	(a) Fishing Vessels	23.800
	(b) Processing Cost	10.260
	Total	34.060
	Less depreciation and interest @ 10 per cent each	17.408
	Grand Total	16.652
III.	**Gross Earnings**	45.970
	Gross earnings minus the cost of operation	29.318

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage
(1)	20.5226	70
(2)	21.9885	75
(3)	21.9885	75
(4)	23.4544	80
(5)	29.3180	100
(6)	26.3862	90
(7)	23.4544	80
(8)	20.5226	70
(9)	19.0567	65
(10)	17.5908	60

Internal Commercial Profitability (based on discounted cash flow with one year gestation period)

23 per cent

Annexure B-7(ii)

Investment and Commercial Profitability of Kandla Fishery Project

(Rs million)

I. Capital Cost	
(a) Fishing Vessels	12.000
(b) Processing Plant	2.480
Total	14.480
II. Cost of Operation	
(a) Fishing Vessels	7.500
(b) Processing Cost	1.540
Total	9.040
Less depreciation and interest @ 10% each	2.896
Grand Total	6.144
III. Gross Earnings	12.000
Gross earnings minus the cost of operation	5.856

Annual earnings over the ten years period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	4.0992	70	28%
(2)	4.3920	75	
(3)	4.3920	75	
(4)	4.6848	80	
(5)	5.8560	100	
(6)	5.2704	90	
(7)	4.6848	80	
(8)	4.0992	70	
(9)	3.8064	65	
(10)	3.5136	60	

Annexure B-7(iii)

Investment and Commercial Profitability of Sassoon Docks (Bombay) Fishery Project

		(Rs million)
I.	**Capital Cost**	
	(a) Fishing Vessels	99.250
	(b) Processing Plant	15.800
	Total	115.05
II.	**Cost of Operation**	
	(a) Fishing Vessels	47.600
	(b) Processing Cost	20.880
	Total	68.480
	Less depreciation and interest @ 10% each	23.010
	Grand Total	45.470
III.	**Gross Earnings**	75.410
	Gross earnings minus the cost of operation	29.940

Annual earnings over the ten years period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	20.9580	70	
(2)	22.4550	75	
(3)	22.4550	75	
(4)	23.9520	80	
(5)	29.9400	100	15%
(6)	26.9460	90	
(7)	23.9526	80	
(8)	20.9580	70	
(9)	19.4610	65	
(10)	17.9640	60	

Annexure B-7(iv)

Investment and Commercial Profitability of Ratnagiri Fishery Project

(Rs million)

I.	Capital Cost	
	(a) Fishing Vessels	30.000
	(b) Processing Plant	
	Total	30.000
II.	Cost of Operation	11.530
	Less depreciation and interest @ 10% each	6.000
	Grand Total	5.530
III.	Gross Earnings	18.930
	Gross earnings minus the cost of operation	13.400

Annual earnings over the ten years period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	1.380	70	
(2)	10.050	75	
(3)	10.050	75	
(4)	10.720	80	
(5)	13.400	100	32%
(6)	12.060	90	
(7)	10.720	80	
(8)	9.380	70	
(9)	8.710	65	
(10)	8.040	60	

Annexure B-7(v)

Investment and Commercial Profitability of Goa Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	9.000
	(b) Processing Plant	1.270
	Total	10.270
II.	**Cost of Operation**	2.750
	Less depreciation and interest @ 10% each	2.054
	Grand Total	0.696
III.	**Gross Earnings**	4.480
	Gross earnings minus the cost of operation	3.784

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	2.6488	70	
(2)	2.8380	75	
(3)	2.8380	75	
(4)	3.0272	80	
(5)	3.7840	100	25%
(6)	3.4056	90	
(7)	3.0272	80	
(8)	2.6488	70	
(9)	2.4596	65	
(10)	2.2704	60	

Annexure B-7(vi)

Investment and Commercial Profitability of Karwar Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	10.730
	(b) Processing Plant	
	(i) Freezing Plant	
	(ii) Canning Plant	
	(iii) Fishmeal Plant	2.020
	Total	12.750
II.	**Cost of Operation**	
	(a) Fishing Vessels	5.790
	(b) Processing Cost	11.596
	Total	17.386
	Less depreciation and interest @ 10% each	2.550
	Grand Total	14.836
III.	**Gross Earnings**	21.490
	Gross earnings minus the cost of operation	6.654

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	4.6578	70	
(2)	4.9905	75	
(3)	4.9905	75	
(4)	5.3232	80	
(5)	6.6540	100	38%
(6)	5.9886	90	
(7)	5.3232	80	
(8)	4.6578	70	
(9)	4.3251	65	
(10)	3.9924	60	

Annexure B-7(vii)

Investment and Commercial Profitability of Malpe Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	31.850
	(b) Processing Plant	4.040
	Total	35.890
II.	**Cost of Operation**	35.780
	Less depreciation and interest @ 10% each	7.178
	Grand Total	28.602
III.	**Gross Earnings**	41.860
	Gross earnings minus the cost of operation	13.258

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	9.2806	70	26%
(2)	9.9435	75	
(3)	9.9435	75	
(4)	10.6064	80	
(5)	13.2580	100	
(6)	11.9322	90	
(7)	10.6064	80	
(8)	9.2806	70	
(9)	8.6177	65	
(10)	7.9548	60	

Annexure B-7(viii)

Investment and Commercial Profitability of Cochin Fishery Project

(Rs million)

I. Capital Cost	
(a) Fishing Vessels	76.750
(b) Processing Plant	8.650
Total	85.400
II. Cost of Operation	
(a) Fishing Vessels	53.760
(b) Processing Cost	39.200
Total	92.960
Less depreciation and interest @ 10% each	17.080
Grand Total	75.880
III. Gross Earnings	103.940
Gross earnings minus the cost of operation	28.060

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability
(1)	19.642	70	(based on discounted cash flow with one year gestation period) 22%
(2)	21.045	75	
(3)	21.045	75	
(4)	22.448	80	
(5)	28.060	100	
(6)	25.254	90	
(7)	22.448	80	
(8)	19.642	70	
(9)	18.239	65	
(10)	16.836	60	

Annexure B-7(ix)

Investment and Commercial Profitability of Vizhinjom Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	118.500
	(b) Processing Plant	8.700
	Total	127.200
II.	**Cost of Operation**	
	(a) Fishing Vessels	48.000
	(b) Processing Cost	19.320
	Total	67.320
	Less depreciation and interest @ 10% each	25.440
	Grand Total	41.880
III.	**Gross Earnings**	81.900
	Gross earnings minus the cost of operation	40.020

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	28.014	70	
(2)	30.015	75	
(3)	30.015	75	
(4)	32.016	80	
(5)	40.020	100	21%
(6)	36.018	90	
(7)	32.016	80	
(8)	28.014	70	
(9)	26.013	65	
(10)	24.012	60	

Annexure B-7(x)

Investment and Commercial Profitability of Tuticorin Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	132.000
	(b) Processing Plant	14.273
	Total	146.273
II.	**Cost of Operation**	
	(a) Fishing Vessels	48.000
	(b) Processing Cost	34.000
	Total	82.000
	Less depreciation and interest @ 10% each	29.2546
	Grand Total	52.7454
III.	**Gross Earnings**	110.5000
	Gross earnings minus the cost of operation	57.7546

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	40.4282	70	
(2)	43.3159	75	
(3)	43.3159	75	
(4)	46.2036	80	
(5)	57.7546	100	28%
(6)	51.9791	90	
(7)	46.2036	80	
(8)	40.4282	70	
(9)	37.5404	65	
(10)	34.6527	60	

Annexure B-7(xi)

Investment and Commercial Profitability of Madras Fishery Project

(Rs million)

I. Capital Cost

(a) Fishing Vessels	147.000
(b) Processing Plant	8.639
Total	155.639

II. Cost of Operation

(a) Fishing Vessels	48.000
(b) Processing Cost	38.740
Total	86.740
Less depreciation and interest @ 10% each	31.1278
Grand Total	55.6122

III. Gross Earnings

Gross Earnings	110.5000
Gross earnings minus the cost of operation	54.8878

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	38.4214	70	
(2)	41.1658	75	
(3)	41.1658	75	
(4)	43.9102	80	
(5)	54.8878	100	24%
(6)	49.3990	90	
(7)	43.9102	80	
(8)	38.4214	70	
(9)	35.6770	65	
(10)	32.9326	60	

Annexure B-7(xii)

Investment and Commercial Profitability of Visakhapatnam Fishery Project

		(Rs million)
I.	**Capital Cost**	
	(a) Fishing Vessels	50.000
	(b) Processing Plant	3.400
	Total	53.400
II.	**Cost of Operation**	
	(a) Fishing Vessels	30.400
	(b) Processing Cost	4.710
	Total	35.110
	Less depreciation and interest @ 10% each	10.680
	Grand Total	24.430
III.	**Gross Earnings**	55.840
	Gross earnings minus the cost of operation	31.410

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	21.9870	70	
(2)	23.5575	75	
(3)	23.5575	75	
(4)	25.1280	80	
(5)	31.4100	100	44%
(6)	28.2690	90	
(7)	25.1280	80	
(8)	21.9870	70	
(9)	20.4165	65	
(10)	18.8460	60	

Annexure B-7(xiii)

Investment and Commercial Profitability of Kakinada Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	12.000
	(b) Processing Plant	1.425
	Total	13.425
II.	**Cost of Operation**	
	(a) Fishing Vessels	9.700
	(b) Processing Cost	3.270
	Total	12.970
	Less depreciation and interest @ 10% each	2.685
	Grand Total	10.285
III.	**Gross Earnings**	23.300
	Gross earnings minus the cost of operation	13.015

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	9.1105	70	
(2)	9.7612	75	
(3)	9.7612	75	
(4)	10.4120	80	
(5)	13.0150	100	above 50%
(6)	11.7135	90	
(7)	10.4120	80	
(8)	9.1105	70	
(9)	8.4597	65	
(10)	7.8090	60	

Annexure B-7(xiv)

Investment and Commercial Profitability of Chandnipal Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	18.000
	(b) Processing Plant	4.560
	Total	22.560
II.	**Cost of Operation**	
	(a) Fishing Vessels	13.500
	(b) Processing Cost	10.200
	Total	23.700
	Less depreciation and interest @ 10% each	4.512
	Grand Total	19.188
III.	**Gross Earnings**	45.000
	Gross earnings minus the cost of operation	25.812

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	18.0684	70	above 50%
(2)	19.3590	75	
(3)	19.3590	75	
(4)	20.6496	80	
(5)	25.8120	100	
(6)	23.2308	90	
(7)	20.6496	80	
(8)	18.0684	70	
(9)	16.7778	65	
(10)	15.4872	60	

Annexure B-7(xv)

Investment and Commercial Profitability
Roychauk Fishery Project

(Rs million)

I. Capital Cost	
(a) Fishing Vessels	29.250
(b) Processing Plant	3.210
Total	32.460
II. Cost of Operation	
(a) Fishing Vessels	13.680
(b) Processing Cost	4.840
Total	18.520
Less depreciation and interest @ 10% each	6.492
Grand Total	12.028
III. Gross Earnings	36.000
Gross earnings minus the cost of operation	23.972

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	16.7804	70	above 50%
(2)	17.9790	75	
(3)	17.9790	75	
(4)	19.1776	80	
(5)	23.9720	100	
(6)	21.5748	90	
(7)	19.1776	80	
(8)	16.7804	70	
(9)	15.5818	65	
(10)	14.3832	60	

Annexure B-7(xvi)

Investment and Commercial Profitability of Andaman & Nicobar Islands Fishery Project

(Rs million)

I.	**Capital Cost**	
	(a) Fishing Vessels	29.500
	(b) Processing Plant	6.670
	Total	36.170
II.	**Cost of Operation**	15.23
	Less depreciation and interest @ 10% each	7.234
	Grand Total	7.996
III.	**Gross Earnings**	13.880
	Gross earnings minus the cost of operation	5.884

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	4.1188	70	
(2)	4.4130	75	
(3)	4.4130	75	
(4)	4.7072	80	
(5)	5.8840	100	4%
(6)	5.2956	90	
(7)	4.7072	80	
(8)	4.1188	70	
(9)	3.8246	65	
(10)	3.5304	60	

Annexure B-7(xvii)

Investment and Commercial Profitability of Laccadive Island Fishery Project

(Rs million)

I. Capital Cost

(a) Fishing Vessels	24.000
(b) Processing Plant	1.570
Total	25.570

II. Cost of Operation

(a) Fishing Vessels	18.000
(b) Processing Cost	3.125
Total	21.125
Less depreciation and interest @ 10% each	5.114
Grand Total	16.011

III. Gross Earnings

Gross Earnings	15.500
Gross earnings minus the cost of operation	-0.511

Annual earnings over the ten year period; based on assumed capacity utilisation

	Earnings	Capacity utilisation in percentage	Internal Commercial Profitability (based on discounted cash flow with one year gestation period)
(1)	-0.35770	70	
(2)	-0.38325	75	
(3)	-0.38325	75	
(4)	-0.40880	80	
(5)	-0.51100	100	Loss
(6)	-0.45990	90	
(7)	-0.40880	80	
(8)	-0.35770	70	
(9)	-0.33215	65	
(10)	-0.30660	60	

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